

A typical visit includes an overview of NASA's mission at NSTL, along with demonstrations of space related hardware and a guided tour of the installation. In addition to live demonstrations and movies the tour includes the Space Shuttle complex, where the Shuttle's main engines undergo test firings, a view of the installation from atop the 90-foot space tower, indoor and outdoor exhibits and displays.

WALLOPS FLIGHT FACILITY

Wallops Island, Va.

The Wallops Flight Facility (WFF), a part of the Goddard Space Flight Center, is located in Virginia on the Atlantic Coast, Delmarva Peninsula. It is approximately 40 miles southeast of Salisbury, Md., and 72 miles north of the Chesapeake Bay Bridge Tunnel. The facility includes three separate areas on the Atlantic Coast of Virginia's Eastern Shore: the main base, the Wallops Island launching site, plus 1,140 acres of marshland. Wallops Island is about 7 miles southeast of the main base and is 5 miles long and 1/2 mile wide at the widest point.

Wallops is responsible for managing NASA's Suborbital Sounding Rocket Projects from mission and flight planning to landing and recovery, including: payload and payload carrier design, development, fabrication, and testing; experiment management support; launch operations; and tracking and data acquisition.

Wallops manages, monitors, schedules, and provides technical analysis of balloon activities conducted for the NASA balloon program and is responsible for managing the National Scientific Balloon Facility at Palestine, Texas.

The GSFC/Wallops Visitor's Center was opened on July 1, 1982. The center is open five days a week, Thursday through Monday, from 10:00 a.m. to 4:00 p.m., for self guided walking tours. Visitors can see a collection of spacecraft and flight articles, as well as exhibits about America's space flight program. Special movies and video presentations can also be viewed.



25th Anniversary
1958-1983

Launch Record

NASA MAJOR LAUNCH RECORD

Compiled by
Barbara E. Selby

NOTE: All launches are from the Eastern Space and Missile Center, Cape Canaveral, Fla., unless otherwise noted. Symbols for launch sites and other items are:

D: Down (reentry or landing date)
KSC: Kennedy Space Center, Fla.
L: Launch date
SMR: San Marco Range, Indian Ocean.
STS: Space Transportation System (Space Shuttle) missions.
WFF: Wallops Flight Facility, Wallops Island, Va.
WSMC: Western Space and Missile Center, Vandenberg AFB, Calif.
WSMR: White Sands Missile Range, N.M.

Mission/Vehicle	Date	Remarks
1958		
Pioneer 1 Thor Able 1	L: 10/11/58 D: 10/12/58	Particles and Fields: Failed to reach moon; sent 43 hours of data.
Beacon 1 Jupiter C	L: 10/23/58 D: 10/23/58	Atmospheric Physics: 12-foot sphere; upper stages separated prior to burnout.
Pioneer 2 Thor Able 1	L: 11/8/58 D: 11/1/58	Scientific Lunar Probe: Third stage failure; reached 963 miles; its brief data indicated equatorial region had higher flux and energy levels than previously thought.
Pioneer 3 Juno II	L: 12/6/58 D: 12/7/58	Energetic Particles: Discovered second radiation belt. Failed to reach moon.

Mission/Vehicle	Date	Remarks
1959		
Vanguard 2 Vanguard (SLV-4)	L: 2/17/59	Meteorology: Precession of satellite prevented usable cloud cover data. First earth photo from satellite.
Pioneer 4 Juno II	L: 3/3/59	Cislunar and Lunar Probe: Energetic particles, passed 37,300 miles from the moon 3/4/59.
Vanguard Vanguard (SLV-5)	L: 4/13/59 D: 4/13/59	Magnetic Fields and Atmospheric Physics: 30-inch sphere; second stage failure.
Vanguard Vanguard (SLV-6)	L: 6/22/59 D: 6/22/59	Solar-Earth Heating: Second stage failure.
Explorer (S-1) Juno II	L: 7/16/59 D: 7/16/59	Energetic Particles: Destroyed after 5 1/2 seconds by range safety officer.
Explorer 6 (S-2) Thor Able	L: 8/7/59 D: Prior to July 1961	Particles and Meteorology: Three radiation levels; crude cloud cover image; ring of electric current circling earth.
Beacon 2 Juno II	L: 8/14/59 D: 8/14/59	Atmospheric Physics: 12-foot sphere; premature fuel depletion in first stage; upper stage malfunction.
Big Joe (Mercury) Atlas	L: 9/9/59 D: 9/9/59	Suborbital Mercury Capsule Test: Capsule successfully recovered after reentry test.
Vanguard 3 Vanguard (SLV-7)	L: 9/18/59	Particles and Fields: Magnetic field survey, lower edge of radiation belt. Last transmission 12/8/59.
Little Joe 1 Little Joe (L/V #6)	L: 10/4/59 D: 10/4/59	Suborbital Mercury Capsule Test: Qualified booster for use with Mercury test program. (WFF)
Explorer 7 Juno II (19A)	L: 10/13/59	Energetic Particles: Data on radiation and magnetic storms; first micrometeorite penetration of sensor.
Little Joe 2 Little Joe (L/V #1A)	L: 11/4/59 D: 11/4/59	Suborbital Mercury Capsule Test: Capsule escape test. Escape rocket had a delayed thrust buildup. (WFF)
Pioneer (P-3) Atlas Able	L: 11/26/59 D: 11/26/59	Lunar Orbiter: Shroud failure after 45 seconds.
Little Joe 3 Little Joe (L/V #2)	L: 12/4/59 D: 12/4/59	Suborbital Mercury Capsule Test: Escape system and biomedical tests; monkey (Sam). (WFF)

Mission/Vehicle	Date	Remarks
1960		
Little Joe 4 Little Joe (L/V #1B)	L: 1/21/60 D: 1/21/60	Suborbital Mercury Capsule Test: Escape system and biomedical test; monkey (Miss Sam) aboard. (WFF)
Pioneer 5 (P-2) Thor Able	L: 3/11/60	Particles and Fields: Ciscythorean space; first solar flare data; solar wind.
Explorer (S-46) Juno II	L: 3/23/60 D: 3/23/60	Energetic Particles: Failure in upper stages.
Tiros 1 Thor Able	L: 4/1/60	Meteorology: First global cloud clover pictures. Last transmission 6/17/60.
Scout X Scout X	L: 4/18/60 D: 4/18/60	Launch Vehicle Development Test: Structural failure prevented third stage ignition (dummy second and fourth stages). (WFF)
Echo A-10 Thor Delta	L: 5/13/60 D: 5/13/60	Communications Earth Satellite: Failure in upper stages of vehicle.
Scout 1 Scout	L: 7/1/60 D: 7/1/60	Launch Vehicle Development Test. (WFF)
Mercury (MA-1) Atlas	L: 7/29/60 D: 7/29/60	Suborbital Mercury Capsule Reentry Test: Atlas exploded.
Echo 1 (A-11) Thor Delta	L: 8/12/60 D: 5/24/68	Communications Earth Satellite: First passive communications satellite; 100-foot sphere used for passive communications and air density experiments.
Pioneer (P-30) Atlas Able	L: 9/25/60 D: 9/25/60	Scientific Lunar Orbiter: Second stage failure.
Scout 2 Scout	L: 10/4/60 D: 10/4/60	Launch Vehicle Development Test: Air Force Special Weapons Center radiation experiment payload included. (WFF)
Explorer 8 Juno II	L: 11/3/60	Ionosphere: Confirmed existence of helium layer in upper atmosphere. Last transmission 12/28/60.
Little Joe 5 Little Joe (L/V #5)	L: 11/8/60 D: 11/8/60	Suborbital Mercury Capsule Test: Mercury capsule system qualification; premature escape rocket firing. (WFF)
Tiros 2 Thor Delta	L: 11/23/60	Meteorology: Optical and infrared photos of global cloud cover.

Mission/Vehicle	Date	Remarks
Explorer Scout	L: 12/4/60 D: 12/4/60	Atmospheric Physics/Vehicle Test: 12-foot sphere; second stage failure. (WFF)
Pioneer (P-31) Atlas Able	L: 12/15/60 D: 12/15/60	Scientific Lunar Orbiter: Exploded after 74 seconds.
Mercury (MR-1A) Redstone	L: 12/19/60 D: 12/19/60	Suborbital Mercury Capsule Test: Unmanned 235-mile flight. Successful.
1961		
Mercury (MR-2) Redstone	L: 1/31/61 D: 1/31/61	Suborbital Mercury Capsule Test: 16-minute flight of chimpanzee (Ham).
Explorer 9 Scout	L: 2/16/61 D: 4/9/64	Atmospheric Physics/Vehicle Test: 12-foot sphere. (WFF)
Mercury (MA-2) Atlas	L: 2/21/61 D: 2/21/61	Suborbital Mercury Capsule Test: Unmanned; 1,425-mile flight. Successful.
Explorer Juno II	L: 2/24/61 D: 2/24/61	Ionosphere: Second stage malfunction prevented third and fourth stage firing.
Little Joe 5A Little Joe (L/V #5A)	L: 3/18/61 D: 3/18/61	Suborbital Mercury Capsule Test: Mercury escape system qualification; premature escape-rocket firing. (WFF)
Mercury (MR-BD) Redstone	L: 3/24/61 D: 3/24/61	Vehicle Test for Mercury Flight: Booster development test necessitated by MR-2 flight results.
Explorer 10 Thor Delta	L: 3/25/61 D: 6/68	Particles and Fields: Interplanetary magnetic field near earth, mainly extension of sun's magnetic field.
Mercury (MA-3) Atlas	L: 4/25/61 D: 4/25/61	Orbital Mercury Capsule Test: Failure in first stage; abort successful.
Explorer 11 Juno II (4 stages)	L: 4/27/61	Gamma Ray Astronomy: Eliminated simultaneous matter-antimatter creation theory of the steady-state cosmology. Last transmission 12/7/61.
Little Joe 5B Little Joe (L/V #5B)	L: 4/28/61 D: 4/28/61	Suborbital Mercury Capsule Test: One booster engine fired late. Repeat of Mercury escape system test. (WFF)
Mercury 3 "Freedom 7" Redstone (MR-3)	L: 5/5/61 D: 5/5/61	Manned suborbital: Alan B. Shepard Jr.; 15 minutes flight time. First U.S. manned flight.
Explorer (S-45a) Juno II	L: 5/24/61 D: 5/24/61	Ionosphere: Second stage failure.

Mission/Vehicle	Date	Remarks
Meteoroid Satellite A Scout	L: 6/30/61 D: 6/30/61	Micrometeoroids/Vehicle Test: Third stage failure. (WFF)
Tiros 3 Thor Delta	L: 7/12/61	Meteorology: Good cloud cover picture, infrared data. Last transmission 2/27/62.
Mercury 4 "Liberty Bell 7" Redstone (MR-4)	L: 7/21/61 D: 7/21/61	Manned suborbital: Virgil I. Grissom; 16 minutes flight time.
Explorer 12 Thor Delta	L: 8/16/61 D: 9/63	Particles and Fields: Identified Van Allen Belt as a magnetosphere.
Ranger 1 Atlas Agena	L: 8/23/61 D: 8/30/61	Particles and Fields: Lower earth orbit than planned.
Explorer 13 Scout	L: 8/25/61 D: 8/28/61	Micrometeoroids/Vehicle Test: Premature reentry after three days. (WFF)
Mercury (MA-4) Atlas	L: 9/13/61 D: 9/13/61	To orbit the unmanned Mercury capsule to test systems and ability to return capsule to predetermined recovery area after one orbit. All capsule tracking and recovery objectives met.
Probe A (P-21) Scout	L: 10/19/61 D: 10/19/61	Scientific Geoprobe/Vehicle Test: Reached 4,261 miles. Electron density measurement; vehicle test. (WFF)
Saturn Test Saturn I (SA-1)	L: 10/27/61 D: 10/17/61	Launch Vehicle Development: Test of propulsion system of the booster (S-1); verification of aerodynamic and structural design of entire vehicle.
Mercury (MS-1) AF 609A (Blue Scout)	L: 11/1/61 D: 11/1/61	Orbital Mercury Network Check: Destroyed after 30 seconds; Air Force launched.
Ranger 2 Atlas Agena	L: 11/18/61 D: 11/20/61	Particles and Fields: Agena failed to restart.
Mercury (MA-5) Atlas	L: 11/29/61 D: 11/29/61	Mercury Orbital Flight: Chimpanzee Enos aboard. Recovered after two orbits.

Mission/Vehicle	Date	Remarks
1962		
Echo (AVT-1) Thor	L: 1/15/62 D: 1/15/62	Suborbital Communications Test: Canister ejection and opening successful but 135-foot sphere ruptured.
Ranger 3 Atlas Agena	L: 1/26/62	Lunar Exploration: TV pictures, hard instrument landing planned; second stage of Agena failed; spacecraft missed the moon by 22,862 miles on 1/28/62.
Tiros 4 Thor Delta	L: 2/8/62	Meteorology: Supported Friendship 7 flight. Transmitted cloud cover photos to 6/10/62.
Mercury 6 "Friendship 7" Atlas (MA-6)	L: 2/20/62 D: 2/20/62	Manned: John H. Glenn Jr.; three orbits. First manned orbital flight by United States; 4 hours, 55 minutes.
Reentry 1 Scout	L: 3/1/62 D: 3/1/62	Launch Vehicle Development and Reentry: Desired speed not achieved. (WFF)
OSO 1 Thor Delta	L: 3/7/62 D: 10/8/81	Solar Physics: Provided data on approximately 75 solar flares. Last transmission 8/6/63.
Probe B Scout	L: 3/29/62 D: 3/29/62	Scientific Geoprobe: Electron density measurements; reached 3,910 miles. (WFF)
Ranger 4 Atlas Agena	L: 4/23/62 D: 4/26/62	Lunar Exploration: TV pictures not obtained; loss of control two hours after launch; first U.S. lunar impact (far side).
Saturn Test Saturn I (SA-2)	L: 4/25/62 D: 4/25/62	Launch Vehicle Test: Carried 95 tons of ballast water in upper stages released at an altitude of 65 miles in order to observe the effect on the upper region of the atmosphere (Project High Water).
Ariel 1 Thor Delta	L: 4/26/62 D: 5/24/76	Ionosphere: Investigated solar effects. First international satellite (United Kingdom cooperative).
Centaur Test 1 Atlas Centaur	L: 5/8/62 D: 5/8/62	Launch Vehicle Development: Centaur exploded before separation.
Mercury 7 "Aurora 7" Atlas (MA-7)	L: 5/24/62 D: 5/24/62	Manned: M. Scott Carpenter; three orbits; 4 hours, 56 minutes.
Tiros 5 Thor Delta	L: 6/19/62	Meteorology: Infrared system inoperative; good cloud cover pictures. Last transmission 5/4/63.

Mission/Vehicle	Date	Remarks
Telstar 1 Thor Delta	L: 7/10/62	Communications: First privately built satellite. First TV transmission; last transmission 2/21/63. Reimbursable.
Echo (AVT-2) Thor	L: 7/18/62 D: 7/18/62	Suborbital Communications Test: Inflation successful; radar indicated sphere surface not as smooth as planned.
Mariner 1 Atlas Agena	L: 7/22/62 D: 7/22/62	Scientific Venus Probe: Atlas deviated from course and was destroyed by Range Safety Officer.
Mariner 2 Atlas Agena	L: 8/27/62	Planetary Exploration: Venus; first successful interplanetary probe. Found no magnetic field; high surface temperatures of approximately 800 degrees F. Passed Venus 12/14/62 at 21,648 miles, 109 days after launch.
Reentry 2 Scout	L: 8/31/62 D: 8/31/62	Reentry Test (28,000 fps): Late third stage ignition; desired speed not achieved. (WFF)
Tiros 6 Thor Delta	L: 9/18/62	Meteorology: Infrared sensor omitted. Last transmission 10/11/63.
Alouette 1 Thor Agena B	L: 9/29/62	Ionosphere: Radiation belt effects. Second international satellite (cooperative with Canada).
Explorer 14 Thor Delta	L: 10/1/62	Particles and Fields: Data compared with that of Explorer 12. Last transmission 2/17/64.
Mercury 8 "Sigma 7" Atlas (MA-8)	L: 10/3/62 D: 10/3/62	Manned: Walter M. Schirra; 6 orbits; 9 hours, 13 minutes.
Ranger 5 Atlas Agena	L: 10/18/62	Lunar Exploration: TV pictures, hard instrument landing planned; power loss; 450 miles from moon 10/20/62; no TV pictures obtained.
Explorer 15 Thor Delta	L: 10/27/62	Particles and Fields: Despin system failed, directional detectors almost unusable. Last transmission 5/19/63.
Saturn (SA-3) Saturn I	L: 11/16/62 D: 11/16/62	Launch Vehicle Development: Second Project High Water using 95 tons of water released at an altitude of 90 nautical miles.
Relay 1 Thor Delta	L: 12/13/62	Communications: Initial power failure overcome. Wideband transmission; TV capability of 300 channel telephone, one way. Last transmission 2/65.

Mission/Vehicle	Date	Remarks
Explorer 16 Scout	L: 12/16/62	Micrometeoroids: First statistical sample; flux level found to lie between estimated extreme; 64 penetrations of sample materials over useful life of seven months. Sensor area 30 square feet. Last transmission 7/22/63. (WFF)
1963		
Syncom 1 Thor Delta	L: 2/14/63	Communications: First synchronous-type orbit. Radio contact lost at insertion into orbit.
Saturn Test Saturn I (SA-4)	L: 3/28/63 D: 3/28/63	Launch Vehicle Development: Programmed in-flight cutoff of one of eight engines in cluster; successfully demonstrated propellant utilization system function.
Explorer 17 Thor Delta	L: 4/3/63 D: 11/14/66	Aeronomy: Discovered belt of neutral helium atoms about earth. Ceased transmitting experiment data 7/10/63.
Telstar 2 Thor Delta	L: 5/7/63	Communications satellite: Last transmission 5/65. Reimbursable.
Mercury 9 "Faith 7" Atlas (MA-9)	L: 5/15/63 D: 5/16/63	Manned: L. Gordon Cooper; 22 orbits; oriented manually for reentry; 34 hours, 20 minutes.
RFD 1 Scout	L: 5/22/63 D: 5/22/63	AEC Reactor Mockup Reentry Flight. Reimbursable.
Tiros 7 Thor Delta	L: 6/19/63	Meteorology: Last transmission 2/3/64.
CRL (USAF) Scout	L: 6/28/63	Cambridge Research Lab: Geophysics. Reimbursable.
Reentry 3 Scout	L: 7/20/63 D: 7/20/63	Reentry Flight Demonstration: Attempted test of an ablation material of super-orbital reentry speeds. (WFF)
Syncom 2 Thor Delta	L: 7/26/63	Communications: First operational satellite in a synchronous type orbit.
Little Joe II Test Little Joe II #1	L: 8/28/63 D: 8/28/63	Suborbital Apollo Launch Vehicle Test: Booster qualification test with dummy payload. (WSMR)
Explorer 18 (IMP-A) Delta (DSV-3C)	L: 11/27/63 D: 12/65	Particles and Fields: Highly elliptical orbit. Confirmed existence of solar wind shock wave on magnetosphere. First Delta with X-258 third stage. Last transmission 5/12/65.

Mission/Vehicle	Date	Remarks
Centaur Test II Atlas Centaur (AC-2)	L: 11/27/63	Vehicle Development: Instrumented with 2,000 pounds of sensors, equipment and telemetry.
Explorer 19 (AD-A) Scout	L: 12/19/63 D: 5/10/81	Atmospheric Physics: 12-foot sphere (Explorer 9 design); polar orbit. Two (passive) experiments. (WSMC)
Tiros 8 Delta (DSV-3B)	L: 12/21/63	Meteorology: Carried Automatic Picture Transmission (APT) System; allowed realtime readout of local cloud pictures using an inexpensive portable ground station. Last transmission 7/1/67.
1964		
Relay 2 Delta (DSV-3B)	L: 1/21/64	Communications: Wideband transmission; TV capability or 300 channel telephone, one way. Last transmission 5/23/64.
Echo 2 Thor Agena	L: 1/25/64 D: 6/7/69	Communications: Rigidized 135-foot sphere; passive. (WSMC)
Saturn I Saturn I (SA-5)	L: 1/29/64 D: 4/30/66	Vehicle Development: Fifth flight of Saturn I; first Block II Saturn; first live flight of the LOX/LH ₂ fueled second stage (S-IV); 1,146 measurements taken.
Ranger 6 Atlas Agena	L: 1/30/64 D: 2/2/64	Lunar Exploration: TV pictures prior to hard landing planned; lunar impact point within 20 miles of target on west edge of Sea of Tranquility; TV system failed to operate.
Beacon Explorer A Delta (DSV-3B)	L: 3/19/64 D: 3/19/64	Ionosphere: Designed to advance state-of-the-art of lasers for optical tracking and geodesy. Third stage (X-248) fired only half normal time; satellite failed to orbit. First Thor Delta failure after 23 successes; last X-248 third stage.
Ariel 2 Scout	L: 3/27/64 D: 11/18/67	Planetary Atmosphere/Radio Astronomy: Continuation of U.K. International Satellite Program; first in program to sample global distribution of ozone with an ultraviolet spectrometer. (WFF)
Gemini 1 Titan II	L: 4/8/64 D: 4/12/64	Space Vehicle Development: Demonstration of the launch vehicle and guidance system and structural integrity and compatibility of the spacecraft and launch vehicle; 132 measurements taken. Spacecraft was not equipped to separate from second stage; first in Gemini series.

Mission/Vehicle	Date	Remarks
Fire 1 Atlas X259	L: 4/14/64 D: 4/14/64	Reentry Test: Investigated the heating environment encountered by a body entering the earth's atmosphere at high speed; actual reentry velocity 37,963 fps.
Apollo Transonic Abort Little Joe II	L: 5/13/64 D: 5/13/64	Apollo LES Development: Simulation of Apollo Launch Escape System where high dynamic pressures and transonic speed conditions exist. First launch of Apollo spacecraft boilerplate. (WSMR)
Saturn I (SA-6) Saturn I	L: 5/28/64 D: 6/1/64	Vehicle Development: Sixth flight of Saturn I; first flight of unmanned boilerplate model of Apollo; 1,181 flight measurements taken.
Centaur Test 3 Atlas Centaur (AC-3)	L: 6/30/64 D: 6/30/64	Vehicle Development: All six primary objectives successful. Hydraulic pump failure caused short Centaur engine burn.
SERT I Scout	L: 7/20/64 D: 7/20/64	Ion Engine Test: Ion beam neutralization in space verified. (WFF)
Ranger 7 Atlas Agena	L: 7/28/64 D: 7/31/64	Lunar Exploration (photography): Camera system yielded 4,316 high resolution TV pictures with about 2,000 times better definition than prior earth-based photography; objects less than 3 feet discernible. Impact occurred in Sea of Clouds region 8 to 10 miles from the aim point; 68 hours, 36 minutes.
Reentry 4 Scout (R-4)	L: 8/18/64 D: 8/18/64	Reentry Test: Demonstrated ability of one type of low density charring ablator material for Apollo to withstand reentry conditions at 17,950 fps. (WFF)
Syncom 3 Delta (DSV-3D)	L: 8/19/64	Communications: Third and last of the Syncom series.
Explorer 20 (IE-A) Scout	L: 8/25/64	Ionosphere: Measurement of electron density distribution in the F ₂ layer by topside sounding on six fixed frequencies. Last transmission 3/30/66. (WSMC)
Nimbus 1 Thor Agena	L: 8/28/64 D: 5/16/74	Meteorology: Earth orientation allowed complete global cloud cover pictures each 24 hours. Contained APT for local readout AVCS for day and HRIR for nighttime cloud cover. Operated about 26 days. (WSMC)

Mission/Vehicle	Date	Remarks
OGO 1 Atlas Agena	L: 9/6/64	Interdisciplinary Studies: Earth-sun interplanetary space interrelationships using a highly elliptical orbit to correlate studies of energetic particles and fields, atmospheric physics, solar and other emissions, interplanetary dust. Not all experimental booms deployed properly thereby interfering with the stabilization systems. Mission unsuccessful.
Saturn I (SA-7) Saturn I	L: 9/18/64 D: 9/22/64	Vehicle Development: Seventh straight Saturn I success. Successful demonstration of Launch Escape System jettisoning.
Explorer 21 (IMP-B) Delta (DSV-3C)	L: 10/4/64 D: 1/30/66	Particles and Fields: Detailed study of environment of cislunar space through cosmic ray, solar wind and magnetic field measurements.
RFD 1 Scout	L: 10/9/64 D: 10/9/64	AEC Reactor Mockup Reentry Flight. Reimbursable.
Explorer 22 Scout	L: 10/10/64	Ionosphere: Measurement of total electron content of ionosphere by effect on four fixed frequencies transmitted to ground. (WSMC)
Mariner 3 Atlas Agena	L: 11/5/64	Planetary Exploration - Mars: Shroud failed to jettison and communications with the spacecraft were lost.
Explorer 23 Scout	L: 11/6/64	Micrometeoroids: Primary sensors were 1- and 2-mil stainless steel pressurized cells; first extended flight test for capacitor detector. Last transmission 11/19/64. (WFF)
Explorer 24 (Air Density) Explorer 25 (Injun) Scout	L: 11/21/64 D: 10/18/68	Atmospheric Physics: First NASA dual payload launch. Air Density, a 12-foot sphere (Explorer 9 and 19 design). Comparison of charged particle energy injection (Injun) with variations in atmospheric temperature and density. Last transmission 7/25/66. (WSMC)
Mariner 4 Atlas Agena	L: 11/28/64	Planetary and Interplanetary Exploration - Mars: Encounter occurred 7/14/65 with closest approach 6,118 miles; 22 pictures taken. Mariner 4 and 5 earth station data obtained August-September 1967.
Apollo Max Q Abort Little Joe II #5	L: 12/8/64 D: 12/8/64	Apollo LES Development: First test of Apollo emergency detection system at abort attitude; first test of the Canard subsystem (for turnaround and stabilization of spacecraft after launch escape) and of the spacecraft protective cover. (WSMR)

Mission/Vehicle	Date	Remarks
Centaur Test 4 Atlas Centaur (AC-4)	L: 12/11/64 D: 12/12/64	Vehicle Development: Carried mass model of Surveyor spacecraft. All primary mission objectives test successful; however, secondary test of second burn not accomplished.
San Marco 1 Scout (SM-A)	L: 12/15/64 D: 9/13/65	Atmospheric Physics: Italian payload, Italian launched. (International cooperative) (WFF)
Explorer 26 Delta (DSV-3C)	L: 12/21/64	Particles and Fields: Study of injection, trapping and loss mechanisms of the trapped radiation belt, both natural and artificial. Last transmission 1/21/67.
1965		
Gemini 2 Titan II	L: 1/19/65 D: 1/19/65	Space Vehicle Development: Unmanned reentry test at maximum heating rate; demonstrated structural integrity and systems performance of the spacecraft throughout flight, reentry and parachute water landing.
Tiros 9 Delta (DSV-3C)	L: 1/22/65	Meteorology: First Tiros "cartwheel" configuration for increased coverage of world cloud cover; elliptical orbit. Turned off 2/15/67.
OSO 2 Delta (DSV-3C)	L: 2/3/65	Solar Physics: Continuation of OSO 1 studies with added ability to scan the solar disc and part of corona. Last transmission 10/7/66.
Pegasus 1 Saturn I (SA-9)	L: 2/16/65 D: 9/17/78	Micrometeoroids: First primary use of capacitor-type penetration detector; sensor area - 2,000 square feet. Data collection terminated 1/13/68.
Ranger 8 Atlas Agena	L: 2/17/65 D: 2/20/65	Lunar Photography: 7,137 pictures obtained; impact occurred about 15 miles from target in Sea of Tranquility. Total flight time to impact: 64 hours, 53 minutes.
Centaur Test 5 Atlas Centaur (AC-5)	L: 3/2/65 D: 3/2/65	Vehicle Development: First attempt to place a Surveyor Dynamic Model in a simulated lunar transfer trajectory; Atlas booster failed about 4 seconds after liftoff.
Ranger 9 Atlas Agena	L: 3/21/65 D: 3/24/65	Lunar Photography: 5,814 pictures obtained; impact less than 3 miles from target in eastern floor of crater Alphonsus. Pictures converted for live viewing on commercial TV. Final mission in Ranger series. Total flight time to impact: 64 hours, 31 minutes.

Mission/Vehicle	Date	Remarks
Gemini 3 Titan II	L: 3/23/65 D: 3/23/65	First Manned Gemini: First U.S. two-man crew: Virgil I. Grissom and John W. Young; 3 orbits, 4 hours, 53 minutes. First use by crew of orbital maneuvering system. First control of reentry flight path using variable spacecraft lift.
Intelsat I F-1 (Early Bird) Delta (DSV-3D)	L: 4/6/65	Communications: First commercial satellite launched by NASA for the COMSAT Corp. on a reimbursable basis; up to 240 voice channels, TV or high-speed data. Geostationary orbit about 27.5 degrees W. longitude.
Explorer 27 Scout	L: 4/29/65	Geodesy: Ultrastable oscillators for precise Doppler tracking of orbital perturbations to obtain description of earth's gravitational field; further laser tracking experimentation. Continuation of Explorer 22 ionospheric measurements. (WFF)
Apollo High Altitude Abort Little Joe II #6	L: 5/19/65 D: 5/19/65	Apollo LES Development: Launch vehicle developed a high spin during early powered flight and eventually disintegrated. Launch escape system satisfactorily sensed vehicle malfunction and separated the spacecraft without damage. High altitude abort test objectives not met. (WSMR)
FIRE 2 Atlas X259	L: 5/22/65 D: 5/22/65	Reentry Test: Second and last FIRE program. Reentry velocity of 37,252 achieved. Excellent data, complementing FIRE 1 data, obtained.
Pegasus 2 Saturn I (SA-8)	L: 5/25/65 D: 11/3/79	Micrometeoroids: Data system improved for increased data reliability. Spacecraft circuitry altered to decrease loss of area due to shorting. Near-earth micrometeoroid environment data was obtained. Data collection terminated 3/14/68.
Explorer 28 (IMP-C) Delta (DSV-3C)	L: 5/29/65 D: 7/4/68	Particles and Fields: Continuation of IMP study of solar-terrestrial relationships, especially magnetosphere boundary; cislunar radiation environment. Orbit somewhat higher than planned.
Gemini 4 Titan II	L: 6/3/65 D: 6/7/65	Manned; Long Duration: James A. McDivitt and Edward H. White; 62 orbits, 97 hours, 56 minutes. First U.S. extravehicular activity (36 minutes duration) and first use of personal propulsion unit (both by White). A program of 11 scientific experiments successfully conducted. Near-rendezvous with booster not achieved.

Mission/Vehicle	Date	Remarks
Tiros 10 (OT-1) Delta (DSV-3C)	L: 7/2/65	Meteorology: First Weather Bureau funded spacecraft; spin-stabilized configuration with two 104-degree TV cameras, similar to Tiros 6. Placed in near-perfect sun-synchronous orbit.
Pegasus 3 Saturn I (SA-10)	L: 7/30/65 D: 8/4/69	Micrometeoroids: Last of Pegasus program. Removable "coupons" added for possible retrieval of thermal coating samples for degradation and cratering study. Last of Saturn I vehicle program with 10 out of 10 successes. Data collection terminated 8/29/68.
Scout Evaluation Vehicle (SEV-A) Scout (S-131-R)	L: 8/10/65	Vehicle Development: Evaluated new Castor II (second stage), FW-4S motor (fourth stage); qualified new spacecraft adapter/separation system; demonstrated yaw maneuver ability, air transportability of fully assembled live Scout. Orbited U.S. Army Secor geodetic satellite. Last transmission 9/10/65. (WFF)
Centaur Test 6 Atlas Centaur VI (AC-6)	L: 8/11/65	Vehicle Development: Fourth successful Atlas Centaur launch accurately injected Surveyor dynamic model into simulated lunar transfer trajectory; demonstrated capability of guidance system.
Gemini 5 Titan II	L: 8/21/65 D: 8/29/65	Manned: L. Gordon Cooper Jr. and Charles Conrad Jr.; 120 revolutions; 190 hours, 56 minutes (8 days). Demonstrated physiological feasibility of lunar mission; evaluated spacecraft performance. Successful simulated rendezvous and 16 of 17 experiments performed; first Gemini use of fuel cell.
OSO C Thor Delta (DSV-3C)	L: 8/25/65 D: 8/25/65	Solar Physics: Spacecraft similar to OSO 1 and 2; failed to orbit; premature ignition of third stage.
OGO 2 Thor Agena	L: 10/14/65 D: 9/17/81	Interdisciplinary Studies: Similar to OGO 1 but in nearly polar, low altitude orbit, emphasizing atmospheric studies and World Magnetic Survey. All appendages successfully deployed and three-axis stabilization temporarily achieved; operated in spin mode due to Horizon Scanner anomaly. Observatory operations discontinued 2/22/68. (WSMC)
Gemini 6 Atlas Agena	L: 10/25/65 D: 10/25/65	Rendezvous and Docking Capability Development: Gemini 6 spacecraft was not launched. Agena apparently exploded at initiation of first burn.

Mission/Vehicle	Date	Remarks
Explorer 29 (GEOS-A) Delta	L: 11/6/65	Geodesy: Intercomparison of satellite tracking system accuracies, investigate earth's gravitational field; improve worldwide geodetic datum accuracies and improve positional accuracies of satellite tracking sites. First improved Delta vehicle. Last transmission 1/16/67.
Explorer 30 Scout	L: 11/19/65	Solar Physics: Monitoring of solar X-rays; to be correlated with optical and radio ground-based observations. Naval Research Laboratory satellite, part of International Quiet Sun Year program. Last transmission 11/7/67. (WFF)
ISIS X Alouette 2 Explorer 31 Thor Agena B	L: 11/19/65	Ionosphere: Dual launch for swept frequency top-side sounding (Alouette) and direct compositional measurement (DME) of the ionosphere and for comparable data especially during proximity of initial orbits. First of ISIS series, continuation of joint Canadian-U.S. program. (WSMC)
Gemini 7 Titan II	L: 12/4/65 D: 12/18/65	Manned: Frank Borman and James A. Lovell Jr.; 206 revolutions, 330 hours, 35 minutes. Extension of physiological testing and spacecraft performance evaluation. Target for first rendezvous (with Gemini 6-A).
French 1A Scout	L: 12/6/65	Ionosphere: Study of VLF wavefield in the magnetosphere and irregularities in distribution of the ionosphere. Spacecraft was designed, constructed and tested by the Centre National d'Etudes in France. Last transmission 8/21/68. (International Cooperative) (WSMC)
Gemini 6A Titan II	L: 12/15/65 D: 12/16/65	Manned: Walter M. Schirra Jr. and Thomas P. Stafford; 15 revolutions, 25 hours, 51 minutes. Accomplished first rendezvous coming within 6 feet of Gemini 7; stationkeeping was maintained for 5 1/2 hours.
Pioneer 6 Thor Delta (DSV-3E)	L: 12/16/65	Particles and Fields: Study of interdisciplinary phenomena in ciscythorean space to within about 0.814 AU*. Five of six experiments functioned.

*Astronomical Unit. Distance from the earth to the sun — 149,599,000 kilometers (93,000,000 miles).

Mission/Vehicle	Date	Remarks
1966		
Intermediate Altitude Abort Little Joe II #7	L: 1/20/66 D: 1/20/66	Apollo LES Development: Last of unmanned ballistic flights; testing Apollo spacecraft atmospheric flight abort capabilities. (WSMR)
ESSA 1 Delta (DSV-3C)	L: 2/3/66	Meteorology: Initiated the Tiros Operational Satellite (TOS) system, designated Environmental Survey Satellite (ESSA 1); TV sensor system. Turned off 5/8/67. Reimbursable.
Reentry 5(E) Scout	L: 2/9/66 D: 2/9/66	Reentry Heating Test: Evaluation of the char integrity of a low density phenolic-nylon ablator at 27,000 fps. (WFF)
Apollo Saturn Saturn 1B (SA-201)	L: 2/26/66 D: 2/26/66	Launch Vehicle Development: Unmanned, sub-orbital; demonstrated the compatibility and structural integrity of the spacecraft/launch vehicle configuration; evaluated heatshield performance at high heating rate; command module recovered.
ESSA 2 Delta (DSV-3E)	L: 2/28/66	Operational Meteorological Satellite: Advanced version of cartwheel configuration. Permits local readout of daylight cloud cover by APT TV system. Polar sun-synchronous orbit. Reimbursable.
Gemini 8 Titan II	L: 3/16/66 D: 3/17/66	Manned: Neil A. Armstrong and David R. Scott; 7 revolutions, 10 hours, 42 minutes. First dual launch and docking with Agena. Mission curtailed by short circuit in Orbital Attitude Maneuvering System (OAMS) depleting fuel through thruster #8. First Pacific landing (in preplanned emergency landing area). Target vehicle exercised through eight-day active life; was available for passive rendezvous.
Atlas Agena (Target Vehicle)	L: 3/16/66 D: 9/15/67	
Centaur Test 7 Atlas Centaur (AC-8)	L: 4/8/66 D: 5/5/66	Vehicle Development: Seventh Atlas Centaur development flight. Major objective: simulate lunar transfer trajectory using parking orbit, "two burn" indirect ascent. Nominal second burn not achieved. Payload: Surveyor mass model.
OA0 1 Atlas Agena	L: 4/8/66	Astronomy: Capable of accurate long duration pointing for ultraviolet, X-ray and gamma ray observations and mapping anywhere in celestial sphere. Spacecraft lost after two days due to spacecraft systems anomalies.

Mission/Vehicle	Date	Remarks
Nimbus 2 Thor Agena B	L: 5/15/66	Meteorology: R&D similar to earth-oriented Nimbus 1 with AVCS, APT and HRIR. Added: Medium Resolution Infrared Radiometer (MRIR) for earth heat balance HRIR, readout by APT and orbit data shown on APT. Completed over 2 1/2 years operation with three-axis stabilization. Spacecraft ceased to operate 1/17/69. (WSMC)
Gemini 9 Atlas Agena	L: 5/17/66 D: 5/17/66	Manned Flight Development: Rendezvous and docking development and to evaluate docked vehicle maneuvering capability and EVA. Target vehicle failed to orbit due to Atlas malfunction; Gemini 9 spacecraft not launched.
Explorer 32 Delta (DSV-3C-1A)	L: 5/25/66	Aeronomy: Similar to Explorer 27 but with solar cells for extended life. Apogee higher than planned (650 nm) but sensors operated to low levels revealing He and H ion distribution in lower exosphere. Last transmission 3/31/67.
Surveyor 1 Atlas Centaur (AC-10)	L: 5/30/66 D: 6/2/66	Lunar Exploration: Achieved soft landing on first engineering test flight (with closed loop guidance) at 2:17 EDT at 2.4 degrees S., 43.43 degrees W. (Ocean of Storms). Selenological data obtained on morphology and lunar origin; bearing strength at Surveyor 1 site and footpad scale about 5 psi; surface material small cohesive particles with rocks up to 3 feet in size; no loose dust; 10,338 pictures taken during first lunar day, 899 during second (total 11,237) lost contact 1/7/67.
Gemini 9A Titan II	L: 6/3/66 D: 6/6/66	Manned: Thomas P. Stafford and Eugene A. Cernan; 44 revolutions, 72 hours, 21 minutes. Unable to dock with ATDA (backup for Gemini Target Vehicle)
Atlas Agena (Target Vehicle)	L: 6/1/66 D: 6/11/66	when shroud failed to clear docking adapter; 2 hours 7 minutes of EVA accomplished; use of Astronaut Maneuvering Unit prevented by difficulty of donning unit and fogging of spacesuit faceplate.
OGO 3 Atlas Agena B	L: 6/7/66	Interdisciplinary Studies: First fully successful OGO; first three-axis stabilization in highly elliptical earth orbit (viewing earth, space, sun and orbital plane). Planned apogee reduced to assure earth tracking throughout orbit. Essentially same experiment as OGO 1.
Pageos 1 Thor Agena	L: 6/24/66	Geodesy: Established worldwide triangulation network by optical sighting of Echo 1 type sphere (100-foot diameter). (WSMC)

Mission/Vehicle	Date	Remarks
Explorer 33 (IMP-D) Thor Delta	L: 7/1/66	Particles and Fields: Planned anchored lunar orbit not obtained. Excess energy orbit produced to launch vehicle precluded lunar capture; consequently, spacecraft was placed in highly elliptical orbit about the earth.
Apollo Saturn Saturn 1B (AS-203)	L: 7/5/66 D: 7/5/66	Launch Vehicle Development: Liquid hydrogen evaluation flight of the S-IVB stage vent and re-start capability. Also test of S-IVB/IU separation and cryogenic storage at zero G. Flight terminated during liquid hydrogen pressure and structural test.
Gemini 10 Titan II	L: 7/18/66 D: 7/21/66	Manned: John W. Young and Michael Collins; 43 revolutions, 70 hours, 47 minutes. First dual rendezvous (with GTV 10 then with GTV 8); first docked vehicle maneuvers; three hatch openings - standup EVA (87 minutes) terminated due to fumes; umbilical EVA (27 minutes) terminated to conserve maneuvering propellant on spacecraft; equipment jettisoned before reentry. Micro-meteoroid experiment retrieved from GTV 8.
Atlas Agena (Target Vehicle)	L: 7/18/66 D: 12/29/66	
Lunar Orbiter 1 Atlas Agena	L: 8/10/66 D: 10/19/66	Lunar Photography: Total of 207 sets (frames) of medium and high resolution pictures taken; 38 from initial 169 from low orbit. Areas covered: nine primary and seven potential Apollo landing sites (including Surveyor 1 site), 11 backside and two earth-moon. Medium resolution pictures good, high resolution smeared. Readout completed 9/13/66, intentionally impacted to avoid interference with second mission.
Pioneer 7 Delta	L: 8/17/66	Particles and Fields: Continued program of measurements over the solar cycle at widely separated points in interplanetary space; about 1.125 AU aphelion. Four of six experiments on.
Apollo Saturn Saturn 1B (AS-202)	L: 8/25/66 D: 8/25/66	Apollo Launch Vehicle and Spacecraft Development: Unmanned, suborbital. Continued test of CSM subsystems and space vehicle structural integrity and compatibility; 1 hour, 23 minute flight evaluated heatshield performance at high heat load; CM 011 recovered near Wake Island.
Gemini 11 Titan II	L: 9/12/66 D: 9/15/66	Manned: Charles Conrad Jr. and Richard F. Gordon Jr.; 44 revolutions, 71 hours, 17 minutes. Rendezvous and docking achieved in 1 hour, 34 minutes, within first spacecraft revolution; 2 hours, 41 minutes; EVA by Gordon; umbilical EVA 44 minutes. Tethered spacecraft experiment successful, computer controlled reentry.
Atlas Agena (Target Vehicle)	L: 9/12/66 D: 12/30/66	

Mission/Vehicle	Date	Remarks
Surveyor 2 Atlas Centaur	L: 9/20/66 D: 9/23/66	Lunar Exploration: During midcourse maneuver, one of the spacecraft's three engines did not ignite causing incorrectable tumbling. Contact lost 5 1/2 hours prior to predicted impact time. Target Site: Sinus Medii.
ESSA 3 Delta (DSV-3E)	L: 10/2/66	Meteorology: First Advanced Vidicon Camera System (AVCS) in Tiros/TOS series; also carried infrared earth heat balance sensor. Advanced cartwheel design, placed in near polar sun-synchronous orbit. First Delta vehicle launch from WSMC. Reimbursable.
Centaur Test 8 Atlas Centaur	L: 10/26/66 D: 11/6/66	Vehicle Development: Second two-burn test for parking orbit, indirect ascent capability; final Centaur development test planned. Surveyor mass model injected into simulated lunar transfer orbit.
Intelsat 2 Delta (DSV-3E)	L: 10/26/66 D: 9/7/82	Communications: Second COMSAT Corp. commercial satellite, NASA providing reimbursable launch support. Apogee motor nozzle blown off shortly after motor ignited. Planned geostationary orbit not achieved. Spacecraft orbit allowed about 8 hours of use per day. Last transmission 10/31/66.
Lunar Orbiter 2 Atlas Agena	L: 11/6/66 D: 10/11/67	Lunar Photography: Spacecraft completed taking 211 frames (422 medium and high resolution pictures) 11/26/66. Spacecraft responded to over 2,870 commands and performed over 280 maneuvers. Readout was completed 12/6/66.
Gemini 12 Titan II	L: 11/11/66 D: 11/15/66	Manned: James A. Lovell Jr. and Edwin E. Aldrin Jr.; 59 revolutions, 94 hours, 34 minutes. Final mission of Gemini series emphasized evaluation of EVA (Aldrin - 5 hours, 30 minutes) tasks workload including two "standups" of 208 and 122 minutes each of umbilical EVA. Also 14 scientific experiments performed and solar eclipse pictures taken. The target vehicle's primary propulsion not usable for high elliptical orbit maneuver.
Atlas Agena (Target Vehicle)	L: 11/11/66 D: 12/23/66	
ATS 1 Atlas Agena	L: 12/7/66	Applications and Technology: Synchronous, circular equatorial orbit over 151 degrees W. longitude (near Hawaii). The Spin Scan Cloud Camera returned the first photo covering nearly the entire disc of the earth 12/9/66. Communications, spacecraft technology and science experiments included in payload.

Mission/Vehicle	Date	Remarks
Biosatellite 1 Delta (DSV-3G)	L: 12/14/66 D: 2/15/67	Biology: Spacecraft completed three days of operation with good environmental control and attitude control. All biological experiment events occurred. The radiation source functioned as planned. Retrofire did not occur and recovery was not possible.
1967		
Intelsat II F-2 Delta (DSV-3E)	L: 1/11/67	Communications: COMSAT commercial satellite; NASA provided reimbursable launch support. Capable of handling TV data transmissions or up to 240 voice channels; part of capacity to be purchased by NASA for Apollo support. Placed about 164 degrees E. in the vicinity of Marshall Islands. Last transmission 1/14/67.
ESSA 4 Delta (DSV-3E)	L: 1/26/67	Meteorology: Advanced version of cartwheel configuration. Nearly polar sun-synchronous orbit. Good APT pictures returned 1/28/67. On 1/29/67 shutter problem made one (of two redundant) APT cameras aboard inoperative. Deactivated 12/6/67. Reimbursable (WSMC)
Lunar Orbiter 3 Atlas Agena	L: 2/5/67 D: 10/9/67	Lunar Photography: 211 sets (frames) of medium and high resolution pictures taken. Picture readout terminated by a transient signal which ended film movement; 72 percent of photos read out. Readout completed for six primary sites, parts of six other sites. Partial readout returned on 31 secondary sites.
OSO 3 (OSO E) Delta (DSV-3C)	L: 3/8/67 D: 4/4/82	Solar Physics: Similar to OSO 1 and 2; carried experiments identical to OSO-C unsuccessfully launched 8/25/65 for obtaining high resolution spectral data within range of 8A-1300A.
Intelsat II F-3 Delta	L: 3/23/67	Communications: COMSAT commercial satellite similar to Intelsat II-A and II-B. Spacecraft placed about 10 degrees W. over Atlantic Ocean. Reimbursable.
ATS 2 Atlas Agena	L: 4/6/67 D: 9/2/69	Gravity Gradient Experiment: Lack of Agena second burn resulted in elliptical, not circular, orbit precluding meaningful evaluation of gravity gradient experiment and resulted in limited data from 11 other experiments; communications, meteorology, albedo, eight environmental. Unsuccessful.

Mission/Vehicle	Date	Remarks
Surveyor 3 Atlas Centaur	L: 4/17/67 D: 4/20/67	Lunar Exploration: Achieved soft landing 4/20/67. Closed loop radar failed during landing and spacecraft landed three times on inertial guidance before its verniers cut off. Surface sampler experiment discovered pebbles of 6 inches and 10 psi bearing strength. The spacecraft returned 6,315 pictures. Site: Oceanus Procellarum, 3.33 degrees S., 23.17 degrees W.
ESSA 5 (TOS-C) Delta (DSV-3E)	L: 4/20/67	Meteorology: Carried Advanced Vidicon Camera System. In sun-synchronous orbit with 3 p.m. local equator crossing time. Officially deactivated by ESSA 2/20/70. Reimbursable. (WSMC)
San Marco 2 Scout	L: 4/26/67 D: 10/14/67	Atmospheric Physics: Italian payload launched from the platform in the Indian Ocean. Spacecraft carried drag and ionospheric experiments. (International Cooperative) (SMR)
Lunar Orbiter 4 Atlas Agena	L: 5/4/67 D: 10/6/67	Lunar Photography: First photos returned 5/11/67. Problems developed with Camera Thermal Door. Readout completed 5/27/67. High resolution photos of over 99 percent of frontside of moon returned; 80 percent of backside has been photographed by Lunar Orbiters 1 and 4.
Ariel 3 (UK-E) Scout	L: 5/5/67 D: 12/14/70	Atmospheric Physics: United Kingdom payload. All five experiments returned data. (International Cooperative) (WSMC)
Explorer 34 (IMP-F) Delta	L: 5/24/67 D: 5/3/69	Particles and Fields: Fifth IMP spacecraft. Investigated region between the magnetosheath and the shock front. Launched during Class III Bright Star solar flare. (WSMC)
ESRO II-A Scout	L: 5/29/67 D: 5/29/67	Solar Astronomy and Cosmic Rays: All telemetry lost 8 seconds prior to third stage cutoff. No fourth stage burn; satellite splashed down in South Pacific. (International Cooperative) (WSMC)
Mariner 5 (Venus 67) Atlas Agena	L: 6/14/67	Planetary/Interplanetary Exploration: All science and engineering subsystems nominal through encounter with Venus; data indicated moon-like effect on solar plasma, strong H ₂ corona comparable to earth's, 72 to 87 percent CO ₂ atmosphere with balance probably nitrogen, no O ₂ . Closest approach: 3,946 kilometers.

Mission/Vehicle	Date	Remarks
Surveyor 4 Atlas Agena (single burn)	L: 7/14/67 D: 7/17/67	Lunar Exploration: All launch vehicle and spacecraft performance nominal until last 2 seconds of 42 second retroburn when all communications were lost with spacecraft. Target site: Sinus Medii.
Explorer 35 (IMP-E) Delta (DSV-3E)	L: 7/19/67	Particles and Fields: Lunar orbit achieved 7/22/67 (first without midcourse correction capability) permitting more detailed study of earth's magnetosphere. No lunar magnetic field or "bow shock wave" observed.
OGO 4 (OGO-D, POGO) Thor Agena	L: 7/28/67 D: 8/16/72	Interdisciplinary Studies: Similar to OGO 2, to obtain data during increased solar activity to complement near solar minimum OGO 2 data. Carried 20 experiments (10 from 9 universities, 1 foreign; 5 GSFC; 1 JPL; 1 SAO; 2 NRL; 1 CRL) emphasizing atmospheric/ionospheric phenomena of near earth environment. (WSMC)
Lunar Orbiter 5 Atlas Agena	L: 8/1/67 D: 1/31/68	Lunar Photography: Last launch in the series of missions to perform mapping of entire lunar surface. Specifically provided: detailed coverage of 36 scientific interest sites; 5 Apollo sites; completed high altitude far side coverage; a full view of earth in near full phase; 100 percent read-out accomplished of all 212 frames taken; provided near-lunar micrometeoroid and radiation data.
Biosatellite 2 Delta (DSV-3G)	L: 9/7/67 D: 9/9/67	Biology: First successful U.S. satellite exclusively for bioscience; obtained excellent data on specimens of cells, plants and low order animals; reentered one day early. Capsule recovered by aircatch.
Surveyor 5 Atlas Centaur	L: 9/8/67 D: 9/11/67	Lunar Exploration: First alpha scatter data; indicated basaltic character of area sampled in Mare Tranquillitatus, 23.19 degrees E. and 1.52 degrees N. Achieved 83 hours alpha scatter data and 18,006 photos in first lunar day. Survived first lunar night but, as expected, subsequent data obtained of lower quality.
Intelsat II F-4 Delta (DSV-3E)	L: 9/28/67	Communications: COMSAT commercial satellite similar to Intelsats II-A, B and C with up to 240 voice channels; to supplement and back up B. Current orbit 63 degrees W. over Pacific Ocean. Provides test of minimum angular separation of B and D without inter-satellite interference. Reimbursable.

Mission/Vehicle	Date	Remarks
OSO 4 Delta (DSV-3C)	L: 10/18/67	Solar Physics: Continuation and expansion of data obtained by OSO program on high resolution spectral data (within range of 1A-1350A) from pointed solar experiments including raster scans of solar disk. Retired 11/1/71.
RAM C-1 Scout	L: 10/19/67 D: 10/19/67	Reentry Environment: Investigation of plasma flow field for solution of associated communications problems of reentry between 25-27,000 fps using water addition techniques. Use of X-band telemetry and plasma and ablation effects on antennas also evaluated. About 25,000 fps re-entry achieved. (WFF)
ATS 3 Atlas Agena	L: 11/5/67	Applications and Technology: Nine experiments involving communications, meteorology, earth photography in color, navigation, stabilization and pointing, degradation of surfaces in space and ionosphere.
Surveyor 6 Atlas Centaur	L: 11/7/67 D: 11/10/67	Lunar Exploration: Sinus Medii, 0.25 degrees N., 1.3 degrees W.; 30,065 TV pictures, 27 hours on-surface alpha scatter analytical time obtained. First liftoff from lunar surface - moved 10 feet to a new location. Sixth in a series of seven Surveyor flights intended to perfect the technology on soft landing on the moon and provide basic scientific and engineering data in support of Apollo.
Apollo 4 (AS-501/CSM-017/ LTA-10R) Saturn V	L: 11/9/67 D: 11/9/67	Launch Vehicle and Spacecraft Development: First launch of Saturn V vehicle (8 1/2 hour mission) to demonstrate launch vehicle capability and spacecraft development. CSM-017 tested Apollo heat shield and simulation of new hatch at lunar reentry velocity; recovered near Hawaii. First launch from Complex 39. Two orbits of 88.3 minutes, then boosted to 1,722 kilometers apogee.
ESSA 6 (TOS-D) Delta (DSV-3E)	L: 11/10/67	Meteorology: Carried two TV systems used for the APT ground stations. Sun-synchronous orbit; spacecraft and launch costs funded by ESSA. Reimbursable. (WSMC)
Pioneer 8	L: 12/13/67	Particles and Fields: Continued program of measurements over solar cycle at widely separated points in interplanetary space about 1.09 AU
Test and Training Satellite-1 Delta (DSV-3E)	L: 12/13/67 D: 4/28/67	Aphelion. Six of six experiments functioned. (TTS-1 - a "piggyback" secondary objective payload for the checkout, training and development of MSFN stations and techniques.

Mission/Vehicle	Date	Remarks
1968		
Surveyor 7 Atlas Centaur	L: 1/7/68 D: 1/10/68	Lunar Exploration: Last Surveyor, emphasized scientific objectives, landed on Tycho ejecta blanket 40.89 degrees S., 11.44 degrees W.; first combination of the three major experiments: TV (2,274 on first day), alpha scatter (48 hours on surface analytical time) and surface sampler.
Explorer 36 (GEOS II) Delta (DSV-3E)	L: 1/11/68	Geodesy: Nearly identical to GEOS-A with C-band transponder and reflector and CW laser detector added. Continued support of the National Geodetic Satellite Program objectives. (WSMC)
Apollo 5 (AS-204/LM) (ascent) (descent) Saturn IB	L: 1/22/68 D: 1/14/68 D: 2/12/68	Lunar Module (LM) Spacecraft Development: First flight test of Apollo LM verified ascent and descent stages propulsion systems, including restart and throttle operations. Also evaluated LM staging and S-IVB/IU orbital performance.
OGO 5 Atlas Agena (SLV-3A)	L: 3/4/68	Interdisciplinary Studies: Three-axis stabilized in highly elliptical earth orbit. Countries providing experiments included England, France and The Netherlands. First satellite spark-chamber experiment. First detection of electric fields in earth's bow shock. Retired 7/14/72.
Explorer 37 (Solar Explorer-B) Scout	L: 3/5/68	Second joint NRL-NASA Spacecraft: Monitored sun's energetic X-ray emissions intensity and time histories and provided real time solar data through COSPAR to scientific community. Six of eight experiments functioned. Last transmission 3/16/70. (WFF)
Apollo 6 (AS-502/CSM-020/ LTA-2R) Saturn V	L: 4/4/68 D: 4/4/68	Launch Vehicle Development: Anomalies experienced with J-2 engine Augmented Spark Ignitors on second and third stages. S-IVB restart not accomplished. F-1 engines on first stage synchronized creating longitudinal vibration of unacceptable amount. Spacecraft performance nominal.
Reentry 6 Scout	L: 4/27/68 D: 4/27/68	Reentry Heating Test: Designed to support the advancement of atmospheric entry technology. Spacecraft performance nominal. (WFF)
IRIS (ESRO IIB) Scout	L: 5/17/68 D: 5/8/71	International Radiation Investigation Satellite: The scientific objective resulted in measuring radiation from the sun and cosmic rays, including X-rays, HE, II line, Lyman Alpha, trapped radiation, solar and Van Allen belt protons, cosmic ray protons, Alpha particles and high energy electrons. (International Cooperative) (WSMC)

Mission/Vehicle	Date	Remarks
Nimbus B Thorad Agena D	L: 5/18/68 D: 5/18/68	Meteorology: Carried two experiments flown on Nimbus 2 and five new ones plus RTQ (SNAP-19) experiment. Planned 1,111-km sun-synchronous polar orbit. Launch vehicle destroyed by range safety after 2 minutes. (WSMC)
Explorer 38 Delta	L: 7/4/68	Radio Astronomy: Four antennas were deployed 10/8/68 to their full and final length 750 feet (1,500 ft. tip-to-tip). The damper boom was also extended to its full length of 315 ft. (630 ft. tip-to-tip). Two of two experiments function. (WSMC)
Explorer 39 (Air Density) Explorer 40 (Injun V) Scout	L: 8/8/68 D: 6/22/81 L: 8/8/68	Interdisciplinary project to continue detailed scientific study of density and radiation characteristics of earth's upper atmosphere at a time of high solar activity. Four of four experiments functioned. (WSMC)
ATS 4 Atlas Centaur	L: 8/10/68 D: 10/17/68	Applications and Technology: Performed communication, meteorology, technology and science experiments. Gravity gradient experiment could not be conducted because spacecraft did not separate from Centaur.
ESSA 7 (TOS-E) Delta	L: 8/16/68	Meteorology: TOS-E, an AVCS-type spacecraft, in a sun-synchronous orbit having a local equator crossing time between 2:35 and 2:55 p.m. so that daily AVCS pictures of the entire globe can be obtained. One AVCS operated. Reimbursable. (WSMC)
RAM C-II Scout	L: 8/22/68 D: 8/22/68	To measure electron and ion concentrations in the flow field at discrete spacecraft locations during reentry. (WFF)
Intelsat III F-1 Delta	L: 9/19/68 D: 9/19/68	Communications: Third generation COMSAT commercial satellite. Improved long-tank Thor Delta destroyed itself 1 minute, 8 seconds into the mission. Control system failure. Reimbursable.
Aurorae (ESRO-I) Scout	L: 10/3/68 D: 6/26/70	Carried eight experiments designed to perform an integrated study of the high latitude ionosphere. (International Cooperative) (WSMC)
Apollo 7 (AS-205/CSM-101) Saturn IV	L: 10/11/68 D: 10/22/68	Manned, CSM Operations: Walter M. Schirra, Donn F. Eisele and Walter Cunningham. Eight successful Service Propulsion firings; seven live TV sessions with crew returned. Rendezvous with S-IVB stage to 70 feet performed. Astronauts developed colds in orbit. Duration: 260 hours, 8 minutes.

Mission/Vehicle	Date	Remarks
Pioneer 9 TETR 2 Delta (DSV-3E)	L: 11/8/68	To collect scientific data on the electromagnetic and plasma properties of the interplanetary medium for a period covering six or more passages of solar activity centers. Six of six experiments functioned (TETR 2, a piggyback secondary objective payload for the checkout, training and development of MSFN stations and techniques).
HEOS-A Delta	L: 12/5/68 D: 10/28/75	First NASA/ESRO reimbursable mission. Scientific satellite for the investigation of interplanetary magnetic fields and the study of solar and cosmic ray particles. Eight of eight experiments operated. Reimbursable.
OA0 2 (A2) Atlas Centaur	L: 12/7/68	Astronomy: Heaviest, most complex U.S. scientific spacecraft built to date. Astronomy investigations by experiments developed by University of Wisconsin and Smithsonian Astrophysical Observatory. Observational objectives include celestial objects in the ultraviolet region of the electromagnetic spectrum. Three of the four Smithsonian instruments functioned, but this instrument was placed on standby in April 1970 to concentrate on the Wisconsin instruments functioned.
ESSA 8 (TOS-F) Delta	L: 12/15/68	Meteorology: Carried two APT camera systems to obtain daily cloud photos all over the globe. Reimbursable. (WSMC)
Intelsat III F-2 Delta	L: 12/18/68	Communications: COMSAT commercial satellite for commercial service between the United States and Puerto Rico. Reimbursable.
Apollo 8 (AS-503/CSM-103) Saturn V	L: 12/21/68 D: 12/27/68	First Manned Saturn V Flight: Frank Borman, James A. Lovell Jr. and William A. Anders, demonstrated crew, space vehicle and mission support facilities performance during a manned lunar orbital mission; 147 hours duration. Mission accomplished 10 lunar orbits returning good lunar photography.
1969		
OSO 5 Delta	L: 1/22/69	Solar Physics: Primary objective to obtain high spectral resolution data (within the 1A-1250A range) from onboard solar experiments pointed toward the sun.
ISIS-A Delta	L: 1/30/69	International Satellite for Ionospheric Studies: Third mission in a series of five in the cooperative U.S.-Canadian space program. (WSMC)

Mission/Vehicle	Date	Remarks
Intelsat III F-3 Delta	L: 2/5/69	Communications: 1,200 two-way circuits for voice, TV and other commercial services; orbit 62 degrees E. longitude over Indian Ocean. Reimbursable.
Mariner 6 Atlas Centaur	L: 2/25/69 D: 5/11/71	Planetary/Interplanetary Exploration: Midcourse correction successfully executed to achieve a Mars flyby within 2,000 miles 7/31/69. Designed to perform investigations of atmospheric structures and compositions and to return TV photos of surface topography.
ESSA 9 (TOS-G) Delta	L: 2/26/69	Meteorology: Ninth and last mission of TOS series. Reimbursable.
Apollo 9 (AS-504/CSM-104/ LM-3) Saturn V	L: 3/3/69 D: 3/13/69	First manned flight of all manned lunar hardware in earth orbit: James McDivitt, David Scott and Russell Schweickart. First manned flight of LM. Successful LM active rendezvous. EVA by Schweickart for 67 minutes; EVA by Scott, 62 minutes. Atlantic recovery postponed one orbit due to weather; 241 hours, 1 minute duration.
Mariner 7 Atlas Centaur	L: 3/27/69 D: 12/30/70	Planetary/Interplanetary Exploration: Spacecraft identical to Mariner 6. Midcourse correction successful for 3,518 km Mars flyby; flyby 8/5/69.
Nimbus 3 Thorad Agena	L: 4/14/69 D: 12/29/71	Meteorology: Carried experiments identical to those carried by Nimbus B. IRIS instrument failed after meeting objectives. (WSMC)
Apollo 10 (AS-505/CSM-106/ LM-4) Saturn V	L: 5/18/69 D: 5/26/69	Manned lunar mission development flight to evaluate LM performance in the cislunar and lunar environment. Eugene A. Cernan, John W. Young and Thomas P. Stafford. Major activities: descent of LM to within 50,000 feet of lunar surface and 19 color TV transmissions. Pacific splash-down; 192 hours, 3 minutes duration.
Intelsat III F-4 Thor Delta	L: 5/22/69	COMSAT commercial global transmissions satellite; 174 degrees E. longitude; over Pacific Ocean. Reimbursable.
OGO 6 Thorad Agena D	L: 6/5/69 D: 10/12/79	Interdisciplinary Studies: Observatory appendage deployment, sun and earth acquisitions were completed successfully. Three axis stabilization was achieved; two 30-foot antennas deployed. (WSMC)

Mission/Vehicle	Date	Remarks
Explorer 41 (IMP-G) Thor Delta	L: 6/21/69 D: 12/23/72	Particles and Fields: Continued study of the environment within and beyond the earth's magnetosphere during period of high solar activity. (WSMC)
Biosatellite 3 (BIOS-D) Delta (DSV-3N)	L: 6/29/69 D: 7/7/69	Biology: Spacecraft in orbit 8 1/2 days with all life support parameters controlled within specifications before deteriorating physiological condition of monkey required recovery of capsule. The animal, when given intensive care in the laboratory, responded initially. However, it expired suddenly about 8 hours later. An autopsy showed death due to heart failure brought about by problems associated with weightlessness and a lower than normal body temperature. Mission judged unsuccessful.
Apollo 11 (AS-506/CSM-107/ LM-5) Saturn V	L: 7/16/69 D: 7/24/69	First manned lunar mission: Limited selenological inspection, photography, survey, evaluation and sampling of the lunar soil. Assessed the capability and limitations of an astronaut and his equipment. Astronauts: Neil A. Armstrong, Michael Collins and Edwin E. Aldrin Jr. Touchdown on lunar surface was July 20. Pacific splashdown 7/24/69, 12:51 p.m. EDT; 165 hours, 18 minutes duration. Returned 44 pounds lunar material.
Intelsat III F-5 Delta	L: 7/26/69	COMSAT global telecommunications: To form part of a global communication, commercial satellite system. Spacecraft did not achieve desired orbit due to third stage failure. Reimbursable.
OSO 6 Delta	L: 8/9/69 D: 3/7/81	Solar Physics: Primary objective to obtain high spectral resolution data (within the 10 to 20 Kev and 1A to 1300A range) from onboard solar experiments pointed toward the sun.
ATS 5 Atlas Centaur	L: 8/12/69	Applications and Technology: To conduct a carefully instrumented gravity gradient orientation experiment directed toward providing the basic design information for the stabilization and control of long-lived spacecraft in synchronous orbit. Mission unsuccessful due to inability to perform primary objectives of the gravity gradient experiment.

Mission/Vehicle	Date	Remarks
Pioneer E Delta	L: 8/27/69 D: 8/27/69	To obtain polar plasma, magnetic field and cosmic ray measurements near the orbital path of the earth but outside the earth's region of influence. This was the fifth and last launch of early Pioneer series. Launch vehicle destroyed by Range Safety Officer after 8 minutes, 2 seconds.
Boreas (ESRO-IB) Scout	L: 10/1/69 D: 11/23/69	Second satellite of the ESRO-I Project. Satellites designed to study ionospheric and auroral phenomena particularly over the northern polar regions in darkness in the winter. Carried eight experiments. Reimbursable. (WSMC)
German Research Satellite-A (AZUR) Scout	L: 11/8/69	Particles and Fields: Study of the inner Van Allen belt, the auroral zones of the Northern Hemisphere and the spectral variations of solar particles versus time during solar flares. (International Cooperative) (WSMC)
Apollo 12 (AS-507/CSM-108/ LM-6) Saturn V	L: 11/14/69 D: 11/24/69	Second manned lunar landing mission: Demonstrated point landing capability, sampled more area, deployed ALSEP, investigated the Surveyor 3 spacecraft and obtained photographs of candidate exploration sites. Astronauts: Charles Conrad Jr., Richard F. Gordon Jr. and Alan Bean. Touchdown on lunar surface 11/19/69. Total EVA time 15 hours, 32 minutes. Duration: 244 hours, 36 minutes; returned 75 pounds lunar material.
Skynet A Delta	L: 11/22/69	Communications: Equatorial synchronous satellite located over Indian Ocean. (International Reimbursable)
1970		
Intelsat III F-6 Delta	L: 1/14/70	COMSAT global telecommunications: To form part of a global communication, commercial satellite system. Reimbursable.
ITOS 1 (Tiros-M) Delta	L: 1/23/70	Meteorology: Second generation meteorology satellite carried TV, APT and scanning radiometers for global cloud data for remote and local readout both day and night. First launch of the Delta with six solid strap-ons; OSCAR ham radio satellite launched from the Delta in orbit. Deactivated by NOAA 6/17/71.

Mission/Vehicle	Date	Remarks
SERT 2 Thor Agena	L: 2/4/70	Ion Engine Test: Demonstrate the capability of an electric ion thruster system to operate six months in space. Mission unsuccessful because it operated short of its full duration due to electrical shortage in high voltage system. (WSMC)
NATOSAT 1 (NATO-A) Delta	L: 3/20/70	Communications: To place a military communications satellite into a stationary equatorial orbit. International; reimbursable.
Nimbus 4 Thor Agena	L: 4/8/70	Meteorology: Fifth in a series of seven advanced research and development weather satellites. Seven of nine experiments were operational.
Apollo 13 (AS-508/CSM-109/ LM-7) Saturn V	L: 4/11/70 D: 4/17/70	Third manned lunar landing attempt aborted after 56 hours GET due to loss of pressure in liquid oxygen in Service Module and the failure of fuel cells 1 and 3. Astronauts: James A. Lovell Jr., Fred W. Haise Jr. and John L. Swigert Jr. Total flight time was 142 hours, 55 minutes. Splashdown in Pacific Ocean.
Intelsat III F-7 Delta	L: 4/22/70	COMSAT Global Telecommunications: To form part of a global communications, commercial satellite system. Reimbursable.
Intelsat III F-8 Delta	L: 7/23/70	COMSAT Global Telecommunications: To form part of a global communications, commercial satellite system. Last launch for Intelsat III series; did not orbit. Reimbursable.
Skynet 2 Delta	L: 8/19/70	United Kingdom Communications Satellite. Vehicle failed. Reimbursable.
RAM C-3 Scout	L: 9/30/70 D: 9/30/70	Compare the effectiveness of a liquid electrophilic (Freon) with water in alleviating radio blackout during a 25,000 fps reentry.
OFO 1 Scout	L: 11/9/70 D: 5/9/71	Obtain direct measurements of the (vestibular nerve) activity changes and study the adaptation of the otolith system (in two bull frogs) under conditions of weightlessness and acceleration.
RMS	L: 9/9/70 D: 2/7/71	Vehicle also carried secondary payload: Radiation/Meteoroid Satellite (RMS); RMS remained attached to Scout fourth stage.

Mission/Vehicle	Date	Remarks
OA0 B Atlas Centaur	L: 11/30/70 D: 11/30/70	To obtain moderate resolution spectrophotometric data in ultraviolet bands between 1100 and 4000Å; to investigate photometry of peculiar stars, the law of interstellar reddening, magnitude and intensity of Lyman-Alpha red shift for nearby galaxies, spectra of emission and reflection nebulae. Nose fairing separation system failed to separate at proper time. Vehicle failure.
ITOS A (NOAA-1) Delta	L: 12/11/70	To conduct in-orbit engineering evaluation so that the daytime and nighttime cloud-cover observations can be obtained regularly and dependably in both direct readout and stored modes of operation. A Cylindrical Electrostatic Probe Experiment (CEPE) was carried piggyback, permanently attached to the Delta second stage. Deactivated by NOAA 8/19/71. Reimbursable.
Explorer 42 (SAS-A) Scout	L: 12/12/70 D: 4/5/79	To develop a catalog of celestial X-ray sources by systematic scanning of the celestial sphere in the energy range 2-20 Kev. First orbiting X-ray satellite. (SMR)
1971		
Intelsat IV F-2 Atlas Centaur	L: 1/25/71	COMSAT Global Telecommunications: To form part of a global communications commercial satellite system. First launch of the Intelsat IV series. Reimbursable.
Apollo 14 (AS-509/CSM-110/ LM-8) Saturn V	L: 1/31/71 D: 2/9/71	Third manned lunar landing: Astronauts Alan B. Shepard, Stuart A. Roosa and Edgar D. Mitchell. Total flight time 216 hours, 42 minutes. Splash-down in the Pacific Ocean 2/9/71. Returned 98 pounds of lunar material.
NATOSAT 2 (NATO-B) Delta	L: 2/2/71	Communications: To place a military communications satellite into a stationary equatorial orbit. Reimbursable.
Explorer 43 (IMP-I) Delta	L: 3/13/71 D: 10/2/74	Extend knowledge of solar-lunar-terrestrial relationships by conducting a continuing study of the interplanetary magnetic field and its dynamic relationships with solar particles.
ISIS 2 Delta	L: 3/31/71	To study electron production and loss and large scale transport of ionization in the ionosphere. Canadian International Cooperative). (WSMC)

Mission/Vehicle	Date	Remarks
San Marco 3 Scout	L: 4/24/71 D: 11/29/71	To investigate and define the equatorial neutral particle atmosphere in terms of density, composition and temperature behavior and variations resulting from solar and geomagnetic activities. Vehicle provided by NASA on non-reimbursable basis; Italian. (SMR)
Mariner Mars 71		To study the dynamic characteristics of the planet Mars from orbit for a minimum period of 90 days also to map 70 percent of the planet.
Mariner 8 Atlas Centaur	L: 5/8/71 D: 5/8/71	Mariner 8 failed because of vehicle malfunction. Mariner 9 entered Mars orbit 11/13/71. It responded to 37,764 commands and transmitted 6,876 pictures of the Mars surface. All scientific instruments operated successfully. Mariner 9 terminated 6:31 p.m. EDT 10/27/72.
Mariner 9 Atlas Centaur	L: 5/30/71	
Planetary Atmosphere Experiment Test Scout	L: 6/20/71 D: 6/20/71	Demonstrate the ability to determine the structure and comparison of the atmosphere through onboard instrumentation from a probe vehicle entering the atmosphere at high speed (25,000 fps). (WFF)
Explorer 44 (SOLRAD 10, NRL) Scout	L: 7/8/71 D: 12/15/79	To monitor the sun's X-ray and ultraviolet emissions in order to better understand the solar physical processes and to improve the prediction techniques of solar activity and ionospheric disturbances. Vehicle provided by NASA on non-reimbursable basis. (WFF)
Apollo 15 (AS-510/CSM-112/LM-10) Saturn V	L: 7/26/71 D: 8/7/71	Fourth manned lunar landing and first of Apollo "J" series missions which carry Lunar Roving Vehicle. Astronauts: David R. Scott, Alfred M. Worden and James B. Irwin. Total flight time 295 hours, 12 minutes. Total EVA time 18 hours, 46 minutes. Worden's in-flight EVA 38 minutes, 12 seconds performed out-of-earth orbit. Splash-down in Pacific about 288 nautical miles due north of Pearl Harbor. Returned 173 pounds of lunar material.
Cooperative Applications Satellite (CAS-A) (EOLE 1) Scout	L: 8/16/71	Data Collection: Cooperation with France in Space Meteorology Project using instrumented balloons and an earth orbiting satellite to obtain in-situ speed and direction of winds (air masses) at various altitudes. (WFF)
Barium Ion Cloud (GRS-B) Scout	L: 9/20/71	Joint NASA/German effort to study the broad features of electric and magnetic fields in the outer radiation belt by optical investigation of the behavior of a barium ion cloud released at several earth radii altitude. Vehicle provided by NASA on non-reimbursable basis. (WFF)

Mission/Vehicle	Date	Remarks
OSO 7 Delta	L: 9/29/71 D: 7/9/74	To observe the active physical processes on the sun by which the sun influences the earth and its space environment; and to advance our understanding of the sun's constitution and behavior.
ITOS B Delta	L: 10/21/71 D: 10/21/71	To provide improved operational infrared and visual observations of earth cloud cover for use in weather analysis and forecasting. NASA reimbursed by NOAA for both spacecraft and launch support. Mission failure due to vehicle second stage malfunction. Reimbursable. (WSMC)
Explorer 45 (SSS-A) Scout	L: 11/15/71	Investigate the ring-current and magnetic storms; relations between auroral phenomena, magnetic storms and the acceleration of charged particles within the inner magnetosphere; and time variations of the particle population. (SMR)
UK 4 (United Kingdom) Scout	L: 12/11/71 D: 12/12/78	Investigate interactions among the plasma, charged particle streams and electromagnetic waves in the upper ionosphere. (International Cooperative) (WSMC)
Intelsat IV F-3 Atlas Centaur	L: 12/19/71	COMSAT global commercial communications satellite system. Reimbursable.
1972		
Intelsat IV F-4 Atlas Centaur	L: 1/22/72	COMSAT global commercial communications satellite system. Reimbursable.
HEOS A-2 Delta	L: 1/31/72 D: 8/2/74	Investigation of interplanetary space and of the high altitude magnetosphere and its boundary in the region around the northern neutral point. ESRO; reimbursable.
Pioneer 10 Atlas Centaur	L: 3/3/72	Investigation of the interplanetary medium; the nature of asteroid belt; and the exploration of Jupiter and its environment.
TD 1 (ESRO) Thor Delta	L: 3/12/72 D: 1/9/80	NASA responsible for placing satellite in an earth orbit for ESRO. Seven scientific experiments aboard the spacecraft. Reimbursable.
Apollo 16 (AS-511/CSM-113/ LM-11) Saturn V	L: 4/16/72 D: 4/27/72	Fifth manned lunar landing; second of Apollo J series carrying the LRV. Astronauts: John W. Young, Thomas K. Mattingly II and Charles M. Duke. Total flight time 265 hours, 51 minutes. Total EVA time 20 hours, 14 minutes; Mattingly's in-flight EVA 1 hour, 24 minutes. Splashdown in Pacific. Returned 213 pounds of lunar material.

Mission/Vehicle	Date	Remarks
Intelsat IV F-5 Atlas Centaur	L: 6/13/72	COMSAT global commercial communications satellite system. Reimbursable.
ERTS 1 (now Landsat) Delta	L: 7/23/72	Acquire synoptic, multispectral repetitive images to investigate disciplines, i.e., agriculture, forestry, mineral and land resources map and chart. (WSMC)
Explorer 46 (MTS) Scout	L: 8/13/72 D: 11/2/79	Measure the meteoroid penetration rates in a bumper protected target and to obtain meteoroid velocity and impact flux data. (WFF)
OA0 3 Copernicus Atlas Centaur	L: 8/21/72	Obtain precise astronomical observations of celestial objects from above the earth's atmosphere so that new and fundamental knowledge about the universe may be acquired.
Transit (INS-1) Scout	L: 9/2/72	U.S. Navy Navigation Satellite. Reimbursable. (WSMC)
Explorer 47 (IMP-H) Delta	L: 9/22/72	Study cislunar radiation environment over significant portion of solar cycle, interplanetary magnetic field and earth's magnetosphere.
NOAA 2 (ITOS-D) AMSAT-OSCAR 6 Delta	L: 10/15/72	Operational meteorological satellite based on Tiros research and development experience. A small communications relay satellite (AMSAT-OSCAR 6) designed to operate in the radio amateur frequency bands carried as a piggyback. Design life of AMSAT-OSCAR 6 at least one year of successful operation in orbit. Reimbursable.
Telesat A (Anik) Delta	L: 11/9/72	First of series of Canadian Domestic Communications Satellites. Designed to provide transmission of television, voice, data, etc., throughout Canada. Reimbursable.
Explorer 48 (SAS-B) Scout	L: 11/16/72 D: 8/20/80	Perform sky survey of high energy gamma radiation from the celestial spheres, to determine the extent of primary galactic gamma radiation and to ascertain the presence of gamma ray point sources. (SMR)
ESRO 4 Scout	L: 11/21/72 D: 4/15/74	Investigate and measure several phenomena in polar ionosphere. Reimbursable. (WSMC)
Apollo 17 (AS-512/CSM-114/ LM-12) Saturn V	L: 12/7/72 D: 12/19/72	Sixth and last manned lunar landing; third of Apollo J series carrying lunar rover. Astronauts: Eugene A. Cernan, Ronald E. Evans and Harrison H. Schmitt; spent 301 hours, 52 minutes in flight. Cernan and Schmitt during the three EVAs completed a total of 22 hours, 4 minutes each. Returned 243 pounds of lunar samples.

Mission/Vehicle	Date	Remarks
Nimbus 5 Delta	L: 12/11/72	Stabilized earth-oriented platform for testing of advanced systems, sensing and collecting meteorological and geological data.
AEROS 2 (German) Scout	L: 12/16/72 D: 8/22/73	Study the state and behavior of upper atmosphere and ionospheric F region, especially with regard to influence of solar ultraviolet radiation. International cooperative. (WSMC)
1973		
Pioneer 11 Atlas Centaur	L: 4/6/73	Obtain precursory scientific information beyond the orbit of Mars with emphasis on investigation of interplanetary medium; investigation of nature of the asteroid belt; and exploration of Jupiter and its environment.
Telesat B (Anik 2) Delta	L: 4/20/73	Second of series of Canadian Domestic Communications Satellites. Designed to transmit TV, voice, data. Reimbursable.
Skylab 1 (Workshop) (513/SIVB-212) Saturn V	L: 5/14/73 D: 7/11/79	Unmanned: Spacecraft comprised of Orbital Workshop, Airlock Module, Multiple Docking Adapter, Apollo Telescope Mount, Instrument Unit and Payload Shroud.
Skylab 2 (206/CSM-116) Saturn IB	L: 5/25/73 D: 6/22/73	First Manned Skylab launch. Crew: Charles Conrad Jr., Joseph P. Kerwin and Paul J. Weitz. Objectives: Establish Skylab Orbital Assembly in earth orbit; conduct series of medical experiments associated with the extension of manned space flight. Recovered SL-2 from Pacific 38.5 minutes after splashdown. Mission duration 28 days, 49 minutes, 49 seconds. Data obtained on 46 of 55 experiments. Crew performed three EVAs totaling 5 hours, 41 minutes.
Explorer 49 (Radio Astronomy Explorer-B) Delta	L: 6/10/73	Make measurements of galactic and solar radio noise at frequencies below ionospheric cutoffs and external to terrestrial background interference by utilization of the moon for occultation, focusing or aperture blocking for increased resolution and discrimination.
ITOS E (NOAA) Delta	L: 7/16/73 D: 7/16/73	Operational meteorological satellite to obtain global cloud cover data both day and night for use in weather analysis and forecasting. NASA reimbursed by NOAA for both spacecraft and launch support. Mission failed due to vehicle second stage malfunction. (WSMC)

Mission/Vehicle	Date	Remarks
Skylab 3 (207/CSM-117) Saturn IB	L: 7/29/73 D: 9/25/73	Second Manned Skylab launch. Crew: Alan L. Bean, Owen K. Garriott and Jack R. Lousma. Crew performed systems and operational tests, assigned experiments and thermal shield deployment. SL-3 recovered from Pacific Ocean 43 minutes after splashdown. Mission duration 59 days, 11 hours, 9 minutes, 4 seconds. Crew performed three EVAs totaling 13 hours, 44 minutes.
Intelsat IV F-7 Atlas Centaur	L: 8/23/73	COMSAT global commercial communications satellite system. Reimbursable.
Explorer 50 (IMP-J) Delta	L: 10/25/73	Perform detailed and near continuous studies of interplanetary environment for orbital periods comparable to several rotations of active solar regions; and to study particle and field interactions in the distant magnetotail including cross sectional mapping of the tail and neutral sheet.
Transit (NNSS/0/20) Scout	L: 10/30/73	U.S. Navy Navigation Satellite. Reimbursable. (WSMC)
NOAA 3 (ITOS-F) Delta	L: 11/6/73	Operational meteorological satellite to obtain global cloud cover data both day and night for use in weather analysis and forecasting. NASA reimbursed by NOAA for both spacecraft and launch support. (WSMC)
Skylab 4 (208/CSM-118) Saturn IB	L: 11/16/73 D: 2/8/74	Third Manned Skylab launch. Crew: Gerald P. Carr, Edward G. Gibson and William R. Pogue. Performed unmanned Saturn workshop operations; reactivate Skylab orbital assembly in earth orbit; obtain medical data on crew for use in extending the duration of manned space flights; performed inflight experiments. SL-4 recovered from Pacific Ocean approximately 40 minutes after splashdown. Mission duration 84 days, 1 hour, 16 minutes. Crew performed four EVAs totaling 22 hours, 21 minutes.
Explorer 51 (Atmosphere Explorer-C) Delta	L: 12/16/73 D: 12/12/78	Investigate the photochemical processes accompanying the absorption of solar ultraviolet radiation in earth's atmosphere by making closely coordinated measurements of reacting constituents from spacecraft with onboard propulsion to permit perigee and apogee altitudes to be varied by command.

Mission/Vehicle	Date	Remarks
1974		
Skynet II-A Delta	L: 1/18/74 D: 1/25/74	United Kingdom Communications Satellite. Vehicle failed due to short circuit in the electronics package of the vehicle. Reimbursable.
Centaur Proof Titan Centaur III E	L: 2/11/74 D: 2/11/74	Demonstrate the capability of the Titan III E Centaur D-IT launch vehicle, the Centaur Standard Shroud and the ability of the Integrate Transfer Launch Facility to support operational Titan/Centaur missions. Vehicle failure.
San Marco 4 Scout	L: 2/18/74 D: 5/4/76	Obtain measurements of the diurnal variations of the equatorial neutral atmosphere density, composition and temperature. International cooperative. (SMR)
UK X4 Scout	L: 3/8/74	Demonstrate an accuracy of better than 3 arc minutes using a gas jet system; to measure the performance in orbit of components of an operational infrared sensor; to check photometric calibration of the sensor to measure the density of sun-reflecting particles near the spacecraft. Reimbursable. (WSMC)
Westar 1 Delta	L: 4/13/74	Western Union domestic communications satellite to provide transmission of communications throughout the United States. Reimbursable.
SMS 1	L: 5/17/74	Part of a global network of geostationary Delta environmental satellites with the objective of providing earth imaging in the visible and infrared spectrum, monitoring space environment.
ATS 6 Titan III C	L: 5/30/74	Applications Technology Satellite to provide a large antenna structure capable of providing good quality TV signals to small, inexpensive ground receivers.
Explorer 52 (Hawkeye) Scout	L: 6/3/74	Study the plasma properties of the magnetosphere in the vicinity of the magnetic neutral point over the earth's north polar cap. (WSMC)
AEROS 2 Scout	L: 7/16/74 D: 9/2/75	Measure the main aeronomic parameters determining the state of the upper atmosphere and the solar ultraviolet radiation in the wavelength band of main absorption. German reimbursable. (WSMC)
ANS 1 Scout	L: 8/30/74 D: 6/14/77	Obtain spectral distribution and other data from celestial X-ray and ultraviolet sources; cooperative with the Netherlands. (WSMC)

Mission/Vehicle	Date	Remarks
Westar 2 Delta	L: 10/10/74	Western Union domestic communications satellite. Reimbursable.
UK 5 (Ariel 5) Scout	L: 10/15/74	Investigate galactic and extragalactic X-ray sources. International cooperative. (SMR)
NOAA 4 (ITOS-G) INTASAT Delta	L: 11/15/74	Meteorological satellite: constructed and launched by NASA. Reimbursed and operated by NOAA. INTASAT: carried piggyback on ITOS-G to measure total electron content, ionospheric irregularities and ionospheric scintillations. Cooperative with Spain. (WSMC)
Intelsat IV F-8 Atlas Centaur	L: 11/21/74	Communications satellite: reimbursed and operated by COMSAT to expand the global satellite system.
Skynet II-B Delta	L: 11/22/74	Communications satellite: United Kingdom reimbursable to provide X-band military communications.
Helios 1 Titan III-E Centaur	L: 12/10/74	Scientific satellite to investigate the properties of and processes in interplanetary space in the direction of and close to the sun. Cooperative with West Germany.
Symphonie A Delta	L: 12/17/74	Communications satellite: Joint project by France and Germany to provide communications to Europe, Africa and South America. Reimbursable.
1975		
Landsat 2 Delta	L: 1/22/75	Second Earth Resources Technology Satellite to locate, map and measure earth resources parameters from space and demonstrate the applicability of this approach to the management of the world's resources. (WSMC)
SMS 2 Delta	L: 2/6/75	Second developmental meteorological satellite to provide continuous observation of environmental phenomena and help develop an environmental network for routine observations and early warning.
Intelsat IV F-6 Atlas Centaur	L: 2/20/75 D: 2/20/75	COMSAT communications satellite. Vehicle failure. Reimbursable.
GEOS 3 Delta	L: 4/9/75	Oceanographic and geodetic satellite to measure ocean topography, sea state and other features of the earth. (WSMC)

Mission/Vehicle	Date	Remarks
Explorer 53 (SAS-C) Scout	L: 5/7/75 D: 4/9/79	Scientific satellite to search for sources radiating in the X-ray, gamma ray, ultraviolet and other spectral regions both inside and beyond our galaxy. (SMR)
Telesat C (Anik 3) Delta	L: 5/7/75	Canadian domestic communications satellite. Reimbursable.
Intelsat IV F-1 Atlas Centaur	L: 5/22/75	COMSAT communications satellite. Reimbursable.
Nimbus 6 Delta	L: 6/12/75	Meteorological satellite: R&D of instruments for expanding capabilities for remote sensing of the atmosphere. (WSMC)
OSO 8 Delta	L: 6/21/75	Scientific satellite to study specific features of the sun.
ASTP Saturn 1B	L: 7/15/75 D: 7/24/75	Apollo Soyuz Test Project. Manned cooperative U.S.-Soviet mission. U.S. crew: Thomas P. Stafford, Vance D. Brand and Donald K. Slayton. Soviet crew: Aleksey A. Leonov and Valeriy N. Kubasov. Docked with Soyuz on 7/17/75. Mission duration 217 hours, 28 minutes.
COS-B Delta	L: 8/8/75	Cosmic ray satellite to study extraterrestrial gamma radiation. Launched for the European Space Agency. Reimbursable. (WSMC)
Viking 1 Titan III Centaur	L: 8/20/75 D: 7/20/76 (Lander)	Scientific investigation of Mars. United States' first attempt to soft land a spacecraft on another planet. Successfully soft landed on 7/20/76. First in situ analysis of surface material on another planet.
Symphonie-B Delta	L: 8/26/75	Communications satellite. French/German cooperative. Reimbursable.
Viking 2 Titan III Centaur	L: 9/9/75 D: 9/3/76 (Lander)	Scientific investigation of Mars. United States' second attempt to soft land on Mars. Successfully soft landed on 9/3/76. Successfully returned scientific data.
Intelsat IVA F-1 Atlas Centaur	L: 9/25/75	First in a series of improved COMSAT communications satellites. Double the capacity of previous Intelsats. Reimbursable.
Explorer 54 (AE-D) Delta	L: 10/6/75 D: 3/12/76	Scientific satellite to investigate the chemical processes and energy transfer mechanisms which control earth's atmosphere. (WSMC)

Mission/Vehicle	Date	Remarks
U.S. Navy Scout	L: 10/12/75	Navy Transit Navigation Satellite. Reimbursable. (WSMC)
GOES 1 (SMS-C) Delta	L: 10/16/75	Geostationary Operational Environmental Satellite. Constructed and launched by NASA. Funded and reimbursed by NOAA.
Explorer 55 (AE-E) Delta	L: 11/20/75 D: 6/10/81	Scientific satellite to investigate the chemical processes and energy transfer mechanisms which control earth's atmosphere.
DAD-A/B Scout	L: 12/5/75 D: 12/5/75	Scientific satellite to measure global density of upper atmosphere and lower exosphere. Vehicle failed. (WSMC)
RCA-A Delta	L: 12/13/75	Communications: First RCA domestic communications satellite. Reimbursable.
1976		
Helios 2 Titan III Centaur	L: 1/15/76	Scientific satellite to investigate the properties in interplanetary space close to the sun. Cooperative with Germany.
CTS Delta	L: 1/17/76	Experimental high powered communications satellite. Cooperative with Canada.
Intelsat IVA F-2 Atlas Centaur	L: 1/29/76	COMSAT communications satellite. Reimbursable
Marisat 1 Delta	L: 2/19/76	COMSAT maritime communications satellite. Reimbursable.
RCA-B Delta	L: 3/26/76	Second RCA (Satcom) domestic communications satellite. Reimbursable.
NATO-III A Delta	L: 4/22/76	Communications satellite for the North Atlantic Treaty Organization. Reimbursable.
LAGEOS Delta	L: 5/4/76	To demonstrate the feasibility and utility of a ground-to-satellite laser system to contribute to the study of solid earth dynamics. (WSMC)
Comstar 1A Atlas Centaur	L: 5/13/76	COMSAT's first domestic communications satellite. Reimbursable.
Air Force Test Scout	L: 5/22/76	To evaluate certain propagation effects of disturbed plasmas on radar and communications systems. Reimbursable. (WSMC)

Mission/Vehicle	Date	Remarks
Marisat 2 Delta	L: 6/9/76	COMSAT maritime communications satellite. Reimbursable.
Gravity Probe-A Scout	L: 6/18/76 D: 6/18/76	Scientific probe to test Einstein's Theory of Relativity. (WFF)
Palapa 1 Delta	L: 7/8/76	Indonesian communications satellite. Reimbursable.
Comstar 2 Atlas Centaur	L: 7/22/76	COMSAT's second domestic communications satellite. Reimbursable.
NOAA 5 (ITOS-H) Delta	L: 7/29/76	Meteorological satellite. Reimbursable. (WSMC)
U.S. Navy (TIP 3) Scout	L: 9/1/76	Transit Improvement Program. U.S. Navy navigation satellite. Reimbursable. (WSMC)
Marisat 3 Delta	L: 10/14/76	COMSAT maritime communications satellite. Reimbursable.
1977		
NATO III B Delta	L: 3/10/77	NATO communications satellite. Reimbursable.
Palapa 2 Delta	L: 3/10/77	Indonesian communications satellite. Reimbursable.
GEOS/ESA Delta	L: 4/20/77	ESA scientific satellite to investigate waves and particles in the magnetosphere. Rated unsuccessful by NASA. Reimbursable.
Intelsat IVA F-4 Atlas Centaur	L: 5/26/77	COMSAT communications satellite. Reimbursable.
GOES 2/NOAA Delta	L: 6/16/77	Geostationary Operational Environmental Satellite. Second in a series launched for NOAA. Reimbursable.
GMS/Japan Delta	L: 7/14/77	Geostationary Meteorological Satellite. First GMS launched for Japan. Reimbursable.
HEAO 1 Atlas Centaur	L: 8/12/77 D: 3/15/79	High Energy Astronomy Observatory: Scientific satellite to study and map X-rays and gamma rays.
Voyager 2 Titan III Centaur	L: 8/20/77	Scientific satellite to study Jupiter and Saturn planetary systems including their satellites and Saturn's rings.

Mission/Vehicle	Date	Remarks
SIRIO/Italy Delta	L: 8/25/77	Scientific satellite: Italian project to investigate trapped radiation flux, magnetic field intensity and variation, and the primary electron energy spectrum. Reimbursable.
Voyager 1 Titan III Centaur	L: 9/5/77	Scientific satellite: Second Voyager launched to investigate Jupiter and Saturn planetary systems.
OTS/ESA Delta	L: 9/13/77 D: 9/13/77	Orbital Test Satellite. ESA experimental communications satellite. Vehicle failure. Reimbursable.
Intelsat IVA F-5 Atlas Centaur	L: 9/29/77	COMSAT communications satellite. Vehicle failure. Reimbursable.
ISEE 1/2 Delta	L: 10/22/77	International Sun-Earth Explorer. Joint NASA/ESA mission to study the interaction of the interplanetary medium with earth's immediate environment. Dual payload; cooperative.
Navy Transit Scout	L: 10/28/77	U.S. Navy navigation satellite. Reimbursable. (WSMC)
Meteosat Delta	L: 11/22/77	ESA meteorological satellite. Europe's contribution to the Global Atmospheric Research Program (GARP). Reimbursable.
CS/Japan Delta	L: 12/14/77	Communications satellite. Launched for Japan. Reimbursable.
1978		
Intelsat IVA Atlas Centaur	L: 1/6/78	COMSAT communications satellite. Reimbursable.
IUE 1 Delta	L: 1/26/78	International Ultraviolet Explorer in cooperation with the European Space Agency and the British Science Research Council. Reimbursable.
FLTSATCOM 1 Atlas Centaur	L: 2/9/78	Fleet communications for U.S. Navy. First in a series. Reimbursable.
Landsat 3 Delta	L: 3/5/78	Ecological data satellite, joins Landsats 1 and 2 in cataloging earth's resources and monitoring changing environmental conditions. (WSMC)
Intelsat IVA F-6 Atlas Centaur	L: 3/31/78	COMSAT communications satellite. Reimbursable.
Japan/BSE Delta	L: 4/7/78	Broadcasting Experimental Satellite. Japanese communications satellite for conducting TV broadcast experiments. Reimbursable.

Mission/Vehicle	Date	Remarks
HCMM Scout	L: 4/26/78 D: 12/22/81	Heat Capacity Mapping Mission to produce thermal maps for discrimination of rock types, mineral resources, plant temperature, soil moisture, snow fields and water runoff. (WSMC)
OTS 2 Delta	L: 5/11/78	Backup European Space Agency Orbital Test Satellite. Reimbursable.
Pioneer Venus 1 Atlas Centaur	L: 5/20/78	Planetary mission to Venus. Orbiter measurements of upper atmosphere, study interaction between solar wind, ionosphere and magnetic field, study atmospheric and surface characteristics, determine gravitational field harmonics.
GOES 3 Delta	L: 6/16/78	Geostationary Environmental Satellite for earth imaging. NOAA reimbursable.
Seasat 1 Atlas F	L: 6/26/78	Sea satellite for global monitoring of ocean geoid, wave topography, surface wind speed and direction, ocean surface temperatures, and ice field extent and dynamics. (WSMC)
Comstar D-3 Atlas Centaur	L: 6/29/78	Third in a series of COMSAT domestic communications satellites. Reimbursable.
GEOS 3 Delta	L: 7/14/78	ESA spacecraft to study atmospheric radiation particles. Reimbursable.
Pioneer Venus 2 Atlas Centaur	L: 8/8/78 D: 12/9/78	Venus multiprobe mission - four hard landers: To determine nature and composition structure and general circulation pattern of the atmosphere of Venus from the surface to high altitudes.
ISEE 3 Delta	L: 8/12/78	International Sun-Earth Explorer. Interplanetary studies with the spacecraft toward the sun sufficiently outside the earth influence for comparison with results of ISEE-1 and 2 missions and of probes to outer planets. Cooperative with ESA.
Tiros-N Atlas F	L: 10/13/78	Polar orbiting operational spacecraft to provide improved meteorological data for NOAA and provide support to the Global Atmospheric Research Program. Piggyback payload: Oscar-7. (WSMC)
Nimbus 7 Delta	L: 10/24/78	Develop and flight test advanced sensors and technology basic to conducting experiments in the pollution monitoring, oceanographic and meteorological disciplines. A piggyback payload called CAMEO (Chemically Active Material Ejected in Orbit) was ejected to study the boundary structure between the polar cap and the auroral belt. (WSMC)

Mission/Vehicle	Date	Remarks
HEAO 2 Atlas Centaur	L: 11/13/78 D: 3/25/82	Second High Energy Astronomical Observatory to study very energetic radiation from space.
NATO-III C Delta	L: 11/19/78	NATO communications satellite. Reimbursable.
Telesat-D Delta	L: 12/16/78	Canadian domestic communications satellite. Reimbursable.
1979		
SCATHA Delta	L: 1/30/79	Satellite to study electrical charge buildup on spacecraft for Air Force.
SAGE Scout	L: 2/18/79	Gathering data on ozone and aerosols in stratosphere. (WFF)
FLTSATCOM 2 Atlas Centaur	L: 5/4/79	Part of a worldwide armed forces communication system.
UK-6 (Ariel) Scout	L: 6/2/79	Scientific studies in high energy astrophysics. (WFF)
NOAA 6 Atlas E/F	L: 6/27/79	Environmental monitoring satellite. (WSMC)
Westar 3 Delta	L: 8/9/79	Western Union communications satellite.
HEAO 3 Atlas Centaur	L: 9/20/79 D: 12/7/81	Study of cosmic ray particles and gamma ray photons.
Magsat Scout	L: 10/30/79 D: 6/11/80	Measure near-earth magnetic field and crustal anomalies. (WSMC)
RCA-SATCOM 3 Delta	L: 12/6/79	Communications satellite; lost after transfer from NASA to RCA.
1980		
FLTSATCOM 3 Atlas Centaur	L: 1/17/80	Part of worldwide armed forces communications system.
Solar Maximum Mission Delta	L: 2/14/80	Scientific studies of solar flare mechanisms; part of international solar year activities.
NOAA-B Atlas-F	L: 5/29/80 D: 5/3/81	Environmental monitoring satellite. Booster failure put satellite into wrong orbit causing mission failure. (WSMC)

Mission/Vehicle	Date	Remarks
GOES 4 Delta	L: 9/9/80	Weather observation for NOAA. Reimbursable.
FLTSATCOM 4 Atlas Centaur	L: 10/30/80	Part of worldwide armed forces communications system.
SBS 1 Delta	L: 11/15/80	Satellite Business Systems advanced communications satellite. Reimbursable.
Intelsat V F-2 Atlas Centaur	L: 12/6/80	Largest commercial communications satellite. Reimbursable.
1981		
Comstar 4 Atlas Centaur	L: 2/21/81	COMSAT communications satellite. Reimbursable.
STS-1 Space Shuttle	L: 4/12/81 D: 4/14/81	First flight of reusable Space Shuttle Columbia (OV 102). Crew: John W. Young and Robert L. Crippen. Proved concept. First landing of U.S. manned spacecraft on land; first use of solid rockets in manned flight. Mission duration 54 hours, 20 minutes, 52 seconds. (KSC)
Navy 20 (NOVA 1) Scout	L: 5/15/81	DOD transit. (WSMC)
GOES 5 Delta	L: 5/22/81	NOAA weather satellite. Reimbursable.
Intelsat V F-1 Atlas Centaur	L: 5/23/81	Intelsat communications. Reimbursable.
NOAA 7 Atlas-F	L: 6/23/81	NOAA weather. (WSMC) Reimbursable.
Dynamics Explorer Delta	L: 8/3/81	NASA scientific. Dual spacecraft, Dynamics Explorers A and B, to study space around earth from the limits of the upper atmosphere to distances far out in the earth's magnetic field. (WSMC)
FLTSATCOM 5 Atlas Centaur	L: 8/6/81	DOD communications.
SBS 2 Delta	L: 9/24/81	Satellite Business Systems communications. Reimbursable.
Solar Mesosphere Explorer Delta	L: 10/6/81	NASA atmospheric research satellite to study reactions between sunlight, ozone and other chemicals in the atmosphere. (WSMC)

Mission/Vehicle	Date	Remarks
STS-2 Space Shuttle	L: 11/12/81 D: 11/14/81	First reuse of spacecraft (Columbia). Crew: Joe H. Engle and Richard H. Truly. Mission planned for 124 hours but ended early due to loss of one of three fuel cells. Remote manipulator arm tested successfully; 90 percent of primary mission objectives accomplished including data acquisition by earth resources pallet OSTA-1. Mission duration 54 hours, 10 minutes, 13 seconds. (KSC)
RCA 3R Delta	L: 11/19/81	RCA commercial communications satellite. Reimbursable.
Intelsat V F-3 Atlas Centaur	L: 12/15/81	Intelsat communications. Reimbursable.
1982		
RCA 4 Delta	L: 1/15/82	RCA commercial communications satellite. Reimbursable.
Westar 4 Delta	L: 2/25/82	Western Union commercial communications satellite. Reimbursable.
Intelsat V F-4 Atlas Centaur	L: 3/4/82	COMSAT international communications satellite. Reimbursable.
STS-3 Space Shuttle	L: 3/22/82 D: 3/30/82	Third flight of orbiter Columbia. Crew: Jack R. Lousma and C. Gordon Fullerton. Payload included space science experiments (OSS-1). Landed at White Sands, N.M., due to wet lakebed at Edwards AFB, Calif. Flight extended one day because of high winds at White Sands. Mission duration 8 days, 4 minutes, 49 seconds. (KSC)
INSAT 1A Delta	L: 4/10/82	India communications satellite. Reimbursable.
Westar 5 Delta	L: 6/8/82	Western Union commercial communications satellite. Reimbursable.
STS-4 Space Shuttle	L: 6/27/82 D: 7/4/82	Fourth Space Shuttle mission (Columbia); final development. Crew: Thomas K. Mattingly II and Henry W. Hartsfield Jr. First landing on a hard surface runway. Mission duration 7 days, 1 hour, 11 minutes, 11 seconds. (KSC)
Landsat 4 Delta	L: 7/16/82	NASA earth resources applications satellite. (WSMC)

Mission/Vehicle	Date	Remarks
Telesat-G Delta	L: 8/26/82	Canadian communications satellite. Reimbursable.
Intelsat V F-5 Atlas Centaur	L: 9/28/82	COMSAT international communications satellite. Reimbursable.
RCA 5 Delta	L: 10/27/82	RCA commercial communications satellite. Reimbursable.
STS-5 Space Shuttle	L: 11/11/82 D: 11/16/82	Fifth flight of orbiter Columbia; first operational mission. First four-man crew: Vance D. Brand, Robert F. Overmyer, Joseph P. Allen and William B. Lenoir. First deployment of satellites from Space Shuttle - SBS-C and Anik-C. Mission duration 5 days, 2 hours, 14 minutes, 25 seconds. (KSC)
SBS 3 PAM-D	L: 11/11/82	Satellite Business Systems commercial communications. First satellite deployed from Space Shuttle. (STS-5)
Anik C-3 PAM-D	L: 11/12/82	Canadian communications satellite. (STS-5)
1983		
IRAS Delta	L: 1/25/83	Infrared Astronomy Satellite. Scientific satellite to perform first all-sky survey to search for objects that emit infrared radiation. Discovered comet IRAS-Araki-Alcock on April 25, 1982. International cooperative with the Netherlands and the United Kingdom. (WSMC)
NOAA 8 Atlas E	L: 3/28/83	An advanced TIROS-N environmental monitoring satellite carrying special search and rescue instrumentation. (WSMC)
STS-6 Space Shuttle	L: 4/4/83 D: 4/9/83	First flight of Space Shuttle orbiter Challenger (OV-099). Crew: Paul J. Weitz, Karol J. Bobko, Donald H. Peterson and Story Musgrave. Deployed TDRS tracking satellite (heaviest Shuttle payload to date); first Space Shuttle extravehicular activity performed by Peterson and Musgrave. Mission duration 5 days, 23 minutes, 42 seconds.
TDRS 1 Inertial Upper Stage	L: 4/4/83	First spacecraft in Tracking and Data Relay Satellite System (TDRSS). IUS second stage failed to place TDRS in its proper orbit; through a series of thruster firings the satellite was moved to its proper orbit on June 29. (STS-6)

Mission/Vehicle	Date	Remarks
RCA 1R Delta	L: 4/11/83	RCA commercial communications satellite. Reimbursable.
GOES-6 Delta	L: 4/28/83	NOAA weather satellite. Reimbursable.
Intelsat V F-6 Atlas Centaur	L: 5/19/83	COMSAT communications satellite. Reimbursable.
Exosat Reimbursable. (WSMC)	L: 5/26/83	ESA X-Ray observatory satellite. Delta
STS-7 Space Shuttle	L: 6/18/83 D: 6/24/83	Second flight of orbiter Challenger; first five-person crew: Robert L. Crippen, Frederick H. Hauck, John M. Fabian, Sally K. Ride (first American woman in space) and Norman E. Thagard. First use of the Remote Manipulator Structure to deploy and retrieve a satellite in space, SPAS-1. Mission duration: 6 days, 2 hours, 24 minutes. (KSC)
Anik C-2 PAM-D	L: 6/18/83	Canadian communications satellite. (STS-5)
Palapa B-1 PAM-D	L: 6/19/83	Indonesian communications satellite. (STS-5)
Galaxy 1 Delta	L: 6/28/83	Hughes commercial communications satellite. Reimbursable.
Telstar 3A Delta	L: 7/28/83	AT&T commercial communications satellite. Reimbursable.

Scheduled for the Remainder of 1983

RCA-G Delta	Aug. 25	RCA communications. Reimbursable.
STS-8 Space Shuttle	Aug. 30	INSAT 1-B deployment. Crew: Richard H. Truly, Daniel C. Brandenstein, Dale A. Gardner, Guion S. Bluford Jr. (first black American astronaut in space) and William E. Thornton. Mission milestones will include the first night launch and landing of a Space Shuttle, first orbital transfer of 40 n. mi. magnitude and first use of Payload Flight Test Article. (KSC)
INSAT-1B PAM-D	Aug. 31	India communications satellite. (STS-8)

Mission/Vehicle	Date	Remarks
Galaxy-B Delta	Sept. 22	Hughes commercial communications satellite. Reimbursable.
STS-9 Space Shuttle	Oct. 28	Spacelab 1. Crew: John W. Young, Brewster W. Shaw Jr., Owen K. Garriott, Robert A. Parker, Ulf Merbold (first foreign crewmember on an American spacecraft) and Byron K. Lichtenberg. Milestones: first flight of payload specialists, first use of the European-built Spacelab, first six-person crew. (KSC)
AF-1 (ITV) Scout	December	Air Force test program. (WFF)
Intelsat VA-A Atlas Centaur	December	Intelsat communications. Reimbursable.
Navy-21	4th Quarter	DOD-NOVA. (WSMC)



25th Anniversary
1958-1983

Astronauts

ASTRONAUTS

Compiled by

Barbara E. Selby

Preface

Of 127 astronauts selected by NASA since April 1959, 78 were on flight status in March 1983. Thirty-seven of the 78 were pilot astronauts and 41 were mission specialist or scientist astronauts.

Nine groups of astronauts have been selected. In Group 1 were the seven Mercury astronauts selected in April 1959. Nine test pilots, Group 2, were selected in September 1962. In Group 3 were 14 pilot astronauts selected in October 1963. Group 4, the first six scientist astronauts, was selected in June 1965. In April 1966, 19 pilot astronauts were selected in Group 5. Group 6, 11 scientist-astronauts, was selected in August 1967. Seven Air Force Manned Orbital Laboratory pilots joined the NASA pilot astronaut program in August 1969, as Group 7. Group 8, 35 men and women, the first group selected specifically for the Space Shuttle in January 1978, completed training in August 1979. Group 9, 19 men and women, selected for the Space Shuttle in July 1980, completed training in August 1981.

NASA will recruit new Space Shuttle astronaut candidate groups as needed. Announcement of recruiting periods will be issued well in advance of the dates when applications will be accepted. Announcements are widely published among scientific and professional journals and lay publications.

STATUS, FLIGHTS AND AFFILIATIONS

Sample entry: (not all data apply to each person)

NAME DATE OF BIRTH/HOMETOWN
SMITH, John A. (Oct. 12, 1940, Dayton, Ohio) --

MILITARY STATUS/EARNED DEGREE(S)/FIELD
 Colonel, USAF (Ret.); Ph.D. (astronomy);

ASTRONAUT GROUP & DATE; FLIGHTS MADE; PERSONAL DATA
 Group 3, October 1963; Gemini 3, Apollo 8; served as Deputy of Flight Systems, Johnson Space Center.

(Rank for all astronauts not on flight status is their rank when they left NASA.)

ALDRIN, Edwin E. Jr. (Jan. 20, 1930, Montclair, N.J.) -- Colonel, USAF (Ret.); B.S. (mechanical engineering), M.D.; Group 3, October 1963; Gemini 12, Apollo 11; resigned from NASA, July 1971; retired from Air Force active duty, March 1, 1972. Science Consultant, Beverly Hills Oil Co., Los Angeles, Calif.

ALLEN, Joseph P. (June 27, 1937, Crawfordsville, Ind.) -- Civilian; B.A. (math-physics), M.S. and Ph.D. (physics); flight, mission specialist; Group 6, August 1967; NASA Assistant Administrator for Legislative Affairs, August 1975-August 1978; served as a mission specialist on STS-5, the first operational flight of the Space Shuttle Orbiter Columbia, Nov. 11-16, 1982.

ANDERS, William A. (Oct. 17, 1933, Hong Kong) -- Colonel, USAF (Reserve) (now major general); B.S., U.S. Naval Academy, M.S. (nuclear engineering); Group 3, October 1963; Apollo 8; resigned from NASA, September 1969. General Manager, General Electric, Aircraft Equipment Division, Utica, N.Y.

ARMSTRONG, Neil A. (Aug. 5, 1930, Wapakoneta, Ohio) -- Civilian; B.S. and M.S. (aeronautical engineering); Group 2, September 1962; Gemini 8, Apollo 11; was Deputy Associate Administrator, Aeronautics, NASA Headquarters Office of Advanced Research and Technology, 1970-1971; resigned from NASA, 1971. Cardwell International Ltd., Lebanon, Ohio.

BAGIAN, James P. (Feb. 22, 1952, Philadelphia, Pa.) -- Civilian, B.S.; (mechanical engineering), M.D.; flight, mission specialist; Group 9, August 1981.

BASSETT, Charles A. (Dec. 30, 1931, Dayton, Ohio) -- Major, USAF; B.S. (electrical engineering); deceased; Group 3, October 1963; died in T-38 jet crash with Elliott See, Feb. 28, 1966, Lambert Municipal Airport, St. Louis, Mo.

- BEAN, Alan L.** (March 15, 1932, Wheeler, Texas, but considers Fort Worth, Texas, his hometown) — Captain, USN (Ret.); B.S. (aeronautical engineering); Group 3, October 1963; Apollo 12, Skylab 3; retired from the Navy, October 1975; resigned from NASA, June 1981 to devote his full time to painting.
- BLAHA, John E.** (Aug. 26, 1942, San Antonio, Texas) — Colonel, USAF; B.S. (engineering science), M.S. (astronautical engineering); flight, pilot; Group 9, August 1981.
- BLUFORD, Guion S. Jr.** (Nov. 22, 1942, Philadelphia, Pa.) — Lt. Colonel, USAF; B.S. (aerospace engineering), M.S. (aerospace engineering); flight, mission specialist; Group 8, August 1979; selected to serve as mission specialist for STS-8.
- BOBKO, Karol J.** (Dec. 23, 1937, New York City) — Colonel, USAF; B.S., Air Force Academy, M.S. (aerospace engineering); flight, pilot; Group 7, August 1969; pilot on STS-6, April 4-9, 1983.
- BOLDEN, Charles F. Jr.** (Aug. 19, 1946, Columbia, S.C.) — Major, USMC; B.S. (electrical science), M.S. (systems management); flight, pilot; Group 9, August 1981.
- BORMAN, Frank** (March 14, 1928, Gary, Ind.) — Colonel, USAF (Ret.); B.S., U.S. Military Academy, M.S. (aeronautical engineering); Group 2, September 1962; Gemini 7, Apollo 8; retired from Air Force and resigned from NASA, July 1970. Chairman, President and Chief Executive Officer, Eastern Airlines, Miami, Fla.
- BRAND, Vance D.** (May 9, 1931, Longmont, Colo., but considers Gainesville, Ga., to be his hometown) — Civilian; B.S. (business and aeronautical engineering), M.S. (business administration); flight, pilot; Group 5, April 1966; Apollo-Soyuz Test Project; commander of STS-5, the fifth flight of Space Shuttle Columbia, Nov. 11-16, 1982; selected to serve as commander on STS-11.
- BRANDENSTEIN, Daniel C.** (Jan. 17, 1943, Watertown, Wis.) — Commander, USN; B.S. (mathematics and physics); flight, pilot; Group 8, August 1979; selected to serve as pilot for STS-8.
- BRIDGES, Roy D. Jr.** (July 19, 1943, Atlanta, Ga., but considers Gainesville, Ga., his hometown) — Lt. Colonel, USAF; B.S. (engineering science), M.S. (astronautics); flight, pilot; Group 9, August 1981.
- BUCHLI, James F.** (June 20, 1945, New Rockford, N.D., but considers Fargo, N.D., his hometown) — Major, USMC; B.S. (aeronautical engineering), M.S. (aeronautical engineering systems); flight, mission specialist; Group 8; August 1979; selected to serve as a mission specialist on STS-10.
- BULL, John S.** (Sept. 25, 1934, Memphis, Tenn.) — Lt. Commander, USN (Ret.); B.S. (mechanical engineering), M.S. and Ph.D. (aeronautical engineering); Group 5, April 1966; resigned from NASA, July 1968; withdrew from astronaut program and the Navy because of pulmonary disease. Member, Guidance and Navigation Branch, Ames Research Center, Mountain View, Calif.
- CARPENTER, M. Scott** (May 1, 1925, Boulder, Colo.) — Commander, USN (Ret.); B.S. (aeronautical engineering); Group 1, April 1959; Mercury 7; joined U.S. Navy SEALAB program in 1967; resigned from NASA, August 1967; retired from Navy, July 1969.

- CARR, Gerald P.** (Aug. 22, 1932, Denver, Colo., but considers Santa Ana, Calif., his hometown) — Colonel, USMC (Ret.); B.S. (mechanical engineering), B.S. and M.S. (aeronautical engineering); Group 5, April 1966; Skylab 4; resigned from NASA, June 1977; retired from Marine Corps, September 1975. Senior Consultant, Applied Research, Inc., Houston.
- CERNAN, Eugene A.** (March 14, 1934, Chicago, Ill.) — Captain, USN (Ret.); B.S. (electrical engineering), M.S. (aeronautical engineering); Group 3, October 1963; Gemini 9, Apollo 10, Apollo 17; resigned from NASA and retired from the Navy, July 1, 1976. Cernan Energy Corp., Houston.
- CHAFFEE, Roger B.** (Feb. 15, 1935, Grand Rapids, Mich.) — Lieutenant commander, USN; B.S. (aeronautical engineering); deceased; Group 3, October 1963; died in Apollo spacecraft fire, Kennedy Space Center, Jan. 27, 1967.
- CHANG, Franklin R.** (April 5, 1950, San Jose, Costa Rica) — Civilian; B.S. (mechanical engineering), Ph.D. (applied plasma physics); flight, mission specialist; Group 9, August 1981.
- CHAPMAN, Philip K.** (March 5, 1935, Melbourne, Australia) — Civilian; B.S. (physics and mathematics), M.S. (aeronautics and astronautics), D.Sc. (instrumentation); Group 6, August 1967; resigned from NASA, July 1972. Arthur D. Little, Inc., Cambridge, Mass.
- CLEAVE, Mary L.** (Feb. 5, 1947, Southampton, N.Y.) — Civilian; B.S. (biological sciences), M.S. (microbial ecology), Ph.D. (civil and environmental engineering); flight, mission specialist; Group 9, August 1981.
- COATS, Michael L.** (Jan. 16, 1946, Sacramento, Calif., but considers Riverside, Calif., his hometown) — Commander, USN; B.S. from the United States Naval Academy, M.S. (administration of science and technology), M.S. (aeronautical engineering); flight, pilot; Group 8, August 1979.
- COLLINS, Michael** (Oct. 31, 1930, Rome Italy) — Colonel (now Major General, USAFR Ret.); B.S. from the U.S. Military Academy; Group 3, October 1963; Gemini 10, Apollo 11; resigned from NASA, January 1970. President, Vought Corp., Arlington, Va.
- CONRAD, Charles Jr.** (June 2, 1930, Philadelphia, Pa.) — Captain, USN (Ret.); B.S. (aeronautical engineering); Group 2, September 1962; Gemini 5, Gemini 11, Apollo 12, Skylab 2; resigned from NASA and retired from Navy, December 1973. Senior Vice President, Marketing, Douglas Aircraft Co., Long Beach, Calif.
- COOPER, L. Gordon** (March 6, 1927, Shawnee, Okla.) — Colonel, USAF (Ret.); B.S. (aeronautical engineering), D.Sc.; Group 1, April 1959; Mercury 9, Gemini 5; retired from NASA and retired from the Air Force in July 1970.
- COVEY, Richard O.** (Aug. 1, 1946, Fayetteville, Ark., but considers Fort Walton Beach, Fla., his hometown) — Lieutenant colonel, USAF; B.S. (engineering sciences), M.S. (aeronautics and astronautics); flight, pilot; Group 8, August 1979.
- CREIGHTON, John O.** (April 28, 1943, Orange, Texas, but considers Seattle, Wash., his hometown) — Commander, USN; B.S. from the United States Naval Academy, M.S. (administration of science and technology); flight, pilot; Group 8, August 1979.

- CRIPPEN, Robert L.** (Sept. 11, 1937, Beaumont, Texas) — Captain, USN; B.S. (aerospace engineering); flight, pilot; Group 7, August 1969; pilot on STS-1, April 12-14, 1981; commander on STS-7, June 18-24, 1983; selected as commander for STS-13.
- CUNNINGHAM, Walter** (March 16, 1932, Creston, Iowa) — Civilian; B.A., M.A. and Ph.D. (physics); Group 3, October 1963; Apollo 7; resigned from NASA, August 1971. The Capital Group, Houston.
- DUKE, Charles M. Jr.** (Oct. 3, 1935, Charlotte, N.C.) — Brig. General, USAF (Reserve); B.S. (naval sciences), M.S. (aeronautics); Group 5, April 1966; Apollo 16; resigned from NASA, December 1975; resigned from USAF, Jan. 1, 1976. Duke Investments and President, Southwest Wilderness Art, Inc.
- DUNBAR, Bonnie J.** (March 3, 1949, Sunnyside, Wash.) — Civilian; B.S. and M.S. (ceramic engineering), presently doctoral candidate in biomedical engineering; flight, mission specialist; Group 9, August 1981.
- EISELE, Donn F.** (June 23, 1930, Columbus, Ohio) — Colonel, USAF (Ret.); M.S. (astronautics); Group 3, October 1963; Apollo 7; resigned from NASA and retired from Air Force, July 1972. Was technical assistant for manned space flight, NASA Langley Research Center, Hampton, Va., 1970-1972. Oppenheimer and Co., Inc., Ft. Lauderdale, Fla.
- ENGLAND, Anthony W.** (May 15, 1942, Indianapolis, Ind., but considers Fargo, N.D., his hometown) — Civilian; B.S. and M.S. (geology and physics), Ph.D. (earth and planetary sciences); flight, mission specialist; Group 6, August 1967; resigned in August 1972 to accept position with the U.S. Geological Survey; rejoined NASA in 1979 as a scientist-astronaut; designated as a mission specialist on STS-24 (Spacelab 2).
- ENGLE, Joe H.** (Aug. 26, 1932, Chapman, Kans.) — Colonel, USAF; B.S. (aeronautical engineering); flight, pilot; Group 5, April 1966; commanded Enterprise Space Shuttle free-flight approach and landing tests 2 and 4, Sept. 13 and Oct. 12, 1977; commander STS-2, Nov. 12-14, 1981; Deputy Associate Administrator for Space Flight at NASA Headquarters, April-December 1982; returned to astronaut duties at the Johnson Space Center to begin training for his next Shuttle flight.
- EVANS, Ronald E.** (Nov. 10, 1935, St. Francis, Kans.) — Captain, USN (Ret.); B.S. (electrical engineering), M.S. (aeronautical engineering); Group 5, April 1966; Apollo 17; retired from Navy, April 1976; resigned from NASA, March 1977. Director, Space Systems Marketing for Sperry Flight Systems, Phoenix, Ariz.
- FABIAN, John M.** (Jan. 28, 1939, Goosecreek, Texas, but considers Pullman, Wash., his hometown) — Colonel, USAF; B.S. (mechanical engineering), M.S. (aerospace engineering), Ph.D. (aeronautics and astronautics); flight, mission specialist; Group 8, August 1979; mission specialist on STS-7, June 18-24, 1983.
- FISHER, Anna L.** (Aug. 24, 1949, St. Albans, N.Y., but considers San Pedro, Calif., her hometown) — Civilian; B.S. (chemistry), M.D.; flight, mission specialist; Group 8, August 1979.
- FISHER, William F.** (April 1, 1946, Dallas, Texas) — Civilian; B.A., M.S. (engineering), M.D.; flight, mission specialist; Group 9, August 1981.

FREEMAN, Theodore C. (Feb. 18, 1930, Haverford, Pa.) — Captain, USAF; B.S. from the U.S. Naval Academy, M.S. (aeronautical engineering); deceased; Group 3, October 1963; died in T-38 crash, Ellington AFB, Houston, Oct. 31, 1964.

FULLERTON, C. Gordon (Oct. 11, 1936, Rochester, N.Y.) — Colonel, USAF; B.S. and M.S. (mechanical engineering); flight, pilot; Group 7, August 1969; piloted Enterprise Space Shuttle free-flight approach and landing tests 1, 3 and 5 on Aug. 12, Sept. 23 and Oct. 26, 1977; pilot for STS-3, March 22-30, 1982.

GARDNER, Dale A. (Nov. 8, 1948, Fairmont, Minn., but considers Clinton, Iowa, his hometown) — Lieutenant commander, USN; B.S. (engineering physics); flight, mission specialist; Group 8, August 1979; selected to serve as a mission specialist for STS-8.

GARDNER, Guy S. (Jan. 6, 1948, Alta Vista, Va.) — Major, USAF; B.S. (engineering sciences), M.S. (astronautics); flight, pilot; Group 9, August 1981.

GARRIOTT, Owen K. (Nov. 22, 1930, Enid, Okla.) — Civilian; B.S., M.S., and Ph.D. (electrical engineering); flight, mission specialist; Group 4, June 1965; Skylab 3; designated to serve as a mission specialist for STS-9 (Spacelab-1).

GIBSON, Edward G. (Nov. 8, 1936, Buffalo, N.Y.) — Civilian; B.S., M.S. (engineering), and Ph.D. (engineering and physics); Group 4, June 1965; Skylab 4; resigned, November 1974, then rejoined NASA in March 1977, and resigned again in October 1980. Advanced Systems Manager, TRW Inc., Redondo Beach, Calif.

GIBSON, Robert L. (Oct. 30, 1946, Cooperstown, N.Y., but considers Lakewood, Calif., his hometown) — Lieutenant commander, USN; B.S. (aeronautical engineering) flight, pilot; Group 8, August 1979; designated to serve as pilot for STS-11.

GIVENS, Edward G. (Jan. 5, 1930, Quanah, Texas) — Major, USAF; B.S. (naval sciences); deceased; Group 5, April 1966, died in an automobile accident near Houston, June 6, 1967.

GLENN, John H. Jr. (July 18, 1921, Cambridge, Ohio) — Colonel, USMC (Ret.); B.S. (engineering); Group 1, April 1959; Mercury 6; resigned from NASA, January 1964. Elected to the U.S. Senate in November 1974, where he now serves.

GORDON, Richard F. Jr. (Oct. 5, 1929, Seattle, Wash.) — Captain, USN (Ret.); B.S. (chemistry); Group 3, October 1963; Gemini 11, Apollo 12; retired from Navy and resigned from NASA, Jan. 1, 1972. President, Astro Systems & Engineering, Inc., Los Angeles, Calif.

GRABE, Ronald J. (June 13, 1945, New York City) — Major, USAF; B.S. (engineering science); flight, pilot; Group 9, August 1981.

GRAVELINE, Duane E. (March 2, 1931, Newport, Vt.) — Civilian, M.D.; resigned, August 1965; Group 4, June 1965.

GREGORY, Frederick D. (Jan. 7, 1941, Washington, D.C.) — Lieutenant colonel, USAF; B.S. from the U. S. Air Force Academy, M.S. (information systems); flight, pilot; Group 8, August 1979; designated to serve as pilot for STS-18 (Spacelab 3).

GRIGGS, S. David (Sept. 7, 1939, Portland, Ore.) — Civilian; B.S. from the U. S. Naval Academy, M.S. (administration); flight, pilot; Group 8, August 1979.

GRISSOM, Virgil I. (April 3, 1926, Mitchell, Ind.) — Lieutenant colonel, USAF; B.S. (mechanical engineering); deceased; Group 1, April 1959; Mercury 4, Gemini 3; died in Apollo spacecraft fire at Kennedy Space Center, Jan. 27, 1967.

HAISE, Fred W. Jr. (Nov. 14, 1933, Biloxi, Miss.) — Civilian; B.S. (aeronautical engineering); Group 5, April 1966; Apollo 13; commanded Enterprise Space Shuttle free-flight approach and landing tests 1, 3 and 5, Aug. 12, Sept. 23 and Oct. 26, 1977; resigned from NASA, June 1979. Vice President, Space Programs, Grumman Aerospace Corp., Bethpage, N.Y.

HART, Terry J. (Oct. 27, 1946, Pittsburgh, Pa.) — Civilian; B.S. and M.S. (mechanical engineering), and M.S. (electrical engineering); flight, mission specialist; Group 8, August 1979; selected to serve as a mission specialist on STS-13.

HARTSFIELD, Henry W. Jr. (Nov. 21, 1933, Birmingham, Ala.) — Colonel, USAF (Ret.); B.S. (physics) and M.S. (engineering science); flight, pilot; Group 7, August 1969; retired from Air Force, August 1977. Pilot for STS-4, June 27-July 4, 1982; selected as commander for STS-12.

HAUCK, Frederick H. (April 11, 1941, Long Beach, Calif., but considers Winchester, Mass., and Washington, D.C., his hometowns) — Captain, USN; B.S. (physics) and M.S. (nuclear engineering); flight, pilot; Group 8, August 1979; pilot for STS-7, June 18-24, 1983.

HAWLEY, Steven A. (Dec. 12, 1951, Ottawa, Kans., but considers Salina, Kans., his hometown) — Civilian; B.A. (physics and astronomy) and Ph.D. (astronomy and astrophysics); flight, mission specialist; Group 8, August 1979; designated to serve as a mission specialist on STS-12.

HENIZE, Karl G. (Oct. 17, 1926, Cincinnati, Ohio) — Civilian; B.A. (mathematics), M.A. and Ph.D. (astronomy); flight, mission specialist; Group 6, August 1967; selected to serve as a mission specialist on STS-24 (Spacelab 2).

HILMERS, David C. (Jan. 28, 1950, Clinton, Iowa, but considers DeWitt, Iowa, his hometown) — Captain, USMC; B.S. (mathematics) and M.S. (electrical engineering); flight, mission specialist; Group 9, August 1981.

HOFFMAN, Jeffrey A. (Nov. 2, 1944, Brooklyn, N.Y., but considers Scarsdale, N.Y., his hometown) — Civilian; B.A. (astronomy) and Ph.D. (astrophysics); flight, mission specialist; Group 8, August 1979.

HOLMQUEST, Donald L. (April 7, 1939, Dallas, Texas) — Civilian; M.D., B.S. (electrical engineering) and Ph.D. (physiology); Group 6, August 1967; took leave of absence May 1971 to hold position of Assistant Professor of Radiology and Physiology, Baylor College of Medicine, Houston; resigned from NASA in September 1973. Now practices medicine on a full-time basis.

IRWIN, James B. (March 17, 1930, Pittsburgh, Pa.) — Colonel, USAF (Ret.); B.S. (naval science) and M.S. (aeronautical and instrumentation engineering); Group 5, April 1966; Apollo 15; resigned from NASA, August 1972. Chairman of Board, High Flight Foundation, Colorado Springs, Colo.

- KERWIN, Joseph P.** (Feb. 19, 1932, Oak Park, Ill.) — Captain, MC, USN; B.A. (philosophy), M.D.; flight, mission specialist; Group 4, June 1965; Skylab 2; currently NASA representative in Australia. At conclusion of this two-year assignment, Kerwin will return to astronaut duties at the Johnson Space Center.
- LEESTMA, David C.** (May 6, 1949, Muskegon, Mich., but considers Tustin, Calif., his hometown) — Lieutenant commander, USN; B.S. and M.S. (aeronautical engineering); flight, mission specialist; Group 9, August 1981.
- LENOIR, William B.** (Mar. 14, 1939, Miami, Fla.) — Civilian; B.S., M.S., and Ph.D. (electrical engineering); flight, mission specialist; Group 6, August 1967; mission specialist on STS-5, Nov. 11-16, 1982.
- LIND, Don L.** (May 18, 1930, Midvale, Utah) — Civilian; B.S. (physics), Ph.D. (physics); flight, pilot; Group 5, April 1966; designated as a mission specialist on STS-18 (Spacelab 3).
- LLEWELLYN, John A.** (April 22, 1933, Cardiff, Wales) — Civilian; Ph.D. (chemistry); resigned, August 1968; Group 6, August 1967.
- LOUNGE, John M.** (June 28, 1946, Denver, Colo., but considers Burlington, Colo., his hometown) — Civilian; B.S. (physics and mathematics), M.S. (astrogeophysics); flight, mission specialist; Group 9, August 1981.
- LOUSMA, Jack R.** (Feb. 29, 1936, Grand Rapids, Mich.) — Colonel, USMC; B.S. (aeronautical engineering); flight, pilot; Group 5, April 1966; Skylab 3, commander STS-3, March 22-30, 1982.
- LOVELL, James A. Jr.** (March 25, 1928, Cleveland, Ohio) — Captain, USN (Ret.); B.S. from the U.S. Naval Academy; Group 2, September 1962; Gemini 7, Gemini 12, Apollo 8, Apollo 13; served as Deputy Director of Science and Applications, Johnson Space Center, May 1971-March 1973; retired from the Navy and resigned from NASA, March 1, 1973. Group Vice President, Centel Corp., Chicago.
- LUCID, Shannon W.** (Jan. 14, 1943, Shanghai, China, but considers Bethany, Okla., her hometown) — Civilian; B.S. (chemistry), M.S. and Ph.D. (biochemistry); flight, mission specialist; Group 8, August 1979.
- MATTINGLY, Thomas K. II** (March 17, 1936, Chicago, Ill.) — Captain, USN; B.S. (aeronautical engineering); flight, pilot; Group 5, April 1966; Apollo 16; commander, STS-4 June 27-July 4, 1982; designated to serve as commander for STS-10.
- McBRIDE, Jon A.** (Aug. 14, 1943, Charleston, W.Va., but considers Beckley, W.Va., his hometown) — Commander, USN; B.S. (aeronautical engineering); flight, pilot; Group 8, August 1979.
- McCANDLESS, Bruce II** (June 8, 1937, Boston, Mass.) — Captain, USN; B.S. (naval sciences), M.S. (electrical engineering); flight, pilot; Group 5, April 1966; selected to serve as a mission specialist on STS-11.

- McDIVITT, James A.** (June 10, 1929, Chicago, Ill.) — Brig. General, USAF (Ret.); B.S. (aeronautical engineering); Group 2, September 1962; Gemini 4, Apollo 9; was Manager, Apollo Spacecraft Program, Johnson Space Center, September 1969-1972; retired from the Air Force and resigned from NASA, June 1972. Senior Vice President, Strategic Management, Rockwell International Corp., Pittsburgh, Pa.
- McNAIR, Ronald E.** (Oct. 21, 1950, Lake City, S.C.) — Civilian; B.S. and Ph.D. (physics); flight, mission specialist; Group 8, August 1979; selected to serve as a mission specialist on STS-11.
- MICHEL, F. Curtis** (June 5, 1934, LaCrosse, Wis.) — Civilian; B.S. and Ph.D. (physics); Group 4, June 1965; resigned from NASA, August 1969. Department of Space Physics and Astronomy, Rice University, Houston, Texas.
- MITCHELL, Edgar D.** (Sept. 17, 1930, Hereford, Texas, but considers Artesia, N.M., his hometown) — Captain, USN (Ret.); B.S. (industrial management and aeronautical engineering), D.Sc. (aeronautics/astronautics); Group 5, April 1966; Apollo 14; retired from the Navy and resigned from NASA, Oct. 1, 1972. Chairman of Board, Forecast Systems, Inc., West Palm Beach, Fla.
- MULLANE, Richard M.** (Sept. 10, 1945, Wichita Falls, Texas, but considers Albuquerque, N.M., his hometown) — Lieutenant colonel, USAF; B.S. (military engineering), M.S. (aeronautical engineering); flight, mission specialist; Group 8, August 1979; selected to serve as a mission specialist on STS-12.
- MUSGRAVE, F. Story** (Aug. 19, 1935, Boston, Mass., but considers Lexington, Ky., his hometown) — Civilian; B.S. (mathematics and statistics), B.A. (chemistry), M.B.A. (operations analysis and computer programming), M.D., M.S. (physiology and biophysics); flight, mission specialist; Group 6, August 1967; mission specialist on STS-6, April 4-9, 1983.
- NAGEL, Steven R.** (Oct. 27, 1946, Canton, Ill.) — Major, USAF; B.S. (aeronautical and astronautical engineering), M.S. (mechanical engineering); flight, pilot; Group 8, August 1979.
- NELSON, George D.** (July 13, 1950, Charles City, Iowa, but considers Willmar, Minn., his hometown) — B.S. (physics), M.S. and Ph.D. (astronomy); flight, mission specialist; Group 8, August 1979; selected to serve as a mission specialist on STS-13.
- O'CONNOR, Bryan D.** (Sept. 6, 1946, Orange, Calif., but considers Twentynine Palms, Calif., his hometown) — Major USMC; B.S. (engineering), M.S. (aeronautical systems); flight, pilot; Group 9, August 1981.
- O'LEARY, Brian T.** (Jan. 27, 1949, Boston, Mass.) — Civilian; Ph.D. (astronomy); resigned, April 1968; Group 6, August 1967. Professor, Princeton University, Princeton, N.J.
- ONIZUKA, Ellison S.** (June 24, 1946, Kealahakua, Kona, Hawaii) — Major, USAF; B.S. and M.S. (aerospace engineering); flight, mission specialist; Group 8, August 1979; designated to serve as a mission specialist for STS-10.

- OVERMYER, Robert F.** (July 14, 1936, Lorain, Ohio, but considers Westlake, Ohio, his hometown) — Colonel, USMC; B.S. (physics), M.S. (aeronautics); flight, pilot; Group 7, August 1969; pilot for STS-5, Nov. 11-16, 1982; designated spacecraft commander for STS-18 (Spacelab 3).
- PARKER, Robert A.** (Dec. 14, 1936, New York City, but considers Shrewsbury, Mass., his hometown) — Civilian; B.A. (astronomy and physics), Ph.D. (astronomy); flight, mission specialist; Group 6, August 1967; designated to serve as a mission specialist for STS-9 (Spacelab 1).
- PETERSON, Donald H.** (Oct. 22, 1933, Winona, Miss.) — Colonel, USAF (Ret.); B.S. from the U.S. Military Academy, M.S. (nuclear engineering); flight, pilot; Group 7, August 1969; retired from Air Force, January 1980; mission specialist on STS-6, April 4-9, 1983.
- POGUE, William R.** (Jan. 23, 1930, Okemah, Okla.) — Colonel, USAF (Ret.); B.S. (education), M.S. (mathematics); Group 5, April 1966; Skylab 4; resigned from NASA, September 1975 and retired from Air Force, September 1975. Self-employed as a consultant to aerospace and energy firms.
- RESNIK, Judith A.** (April 5, 1949, Akron, Ohio) — Civilian; B.S. and Ph.D. (electrical engineering); flight, mission specialist; Group 8, August 1979; designated as a mission specialist on STS-12.
- RICHARDS, Richard N.** (Aug. 24, 1946, Key West, Fla., but considers St. Louis, Mo., his hometown) — Lieutenant commander, USN; B.S. (chemical engineering), M.S. (aeronautical systems); flight, pilot; Group 9, August 1981.
- RIDE, Sally K.** (May 26, 1951, Los Angeles, Calif.) — Civilian; B.A. (English), B.S., M.S. and Ph.D. (physics); flight, mission specialist; Group 8, August 1979; mission specialist on STS-7, June 18-24, 1983.
- ROOSA, Stuart A.** (Aug. 15, 1933, Durango, Colo.) — Colonel, USAF (Ret.); B.S. (aeronautical engineering); Group 5, April 1966; Apollo 14; resigned from NASA and retired from Air Force, Feb. 1, 1976. President and owner, Gulf Coast Coors, Inc., Gulfport, Miss.
- ROSS, Jerry L.** (Jan. 20, 1948, Crown Point, Ind.) — Captain, USAF; B.S. and M.S. (mechanical engineering); flight, mission specialist; Group 9, August 1981.
- SCHIRRA, Walter M. Jr.** (March 12, 1923, Hackensack, N.J.) — Captain, USN (Ret.); B.S. from the U.S. Naval Academy; Group 1, April 1959; Mercury 8, Gemini 6, Apollo 7; resigned from NASA and retired from Navy in July 1969. President, Schirra Enterprises.
- SCHMITT, Harrison H.** (July 3, 1935, Santa Rita, N.M.) — Civilian; B.S. (science), Ph.D. (geology); Group 4, June 1965; Apollo 17; Special Assistant to NASA Administrator for Energy Research and Development, February 1974; appointed NASA Assistant Administrator for Energy Programs, May 1974; resigned from NASA, August 1975. Elected U.S. Senator from New Mexico in November 1976; defeated for reelection in November 1982.

- SCHWEICKART, Russell L.** (Oct. 25, 1935, Neptune, N.J.) — Civilian; B.S. (aeronautical engineering), M.S. (aeronautics and astronautics); Group 3, October 1963; Apollo 9; transferred to NASA Headquarters, Washington, D.C., May 1, 1974; detailed to California Governor in 1977 under Intergovernmental Personnel Act; resigned from NASA, August 1979. Chairman, California Energy Commission, Sacramento, Calif.
- SCOBEE, Francis R.** (May 19, 1939, Cle Elum, Wash.) — Major, USAF, (Ret.); B.S. (aerospace engineering); flight, pilot; Group 8, August 1979; retired from Air Force, January 1980; designated to serve as pilot for STS-13.
- SCOTT, David R.** (June 6, 1932, San Antonio, Texas) — Colonel, USAF (Ret.); B.S. from the U.S. Military Academy, M.S. (aeronautics and astronautics); Group 3, October 1963; Gemini 8, Apollo 9, Apollo 15; Special Assistant for Mission Operations, Apollo Spacecraft Program Office, Johnson Space Center, July 1972–August 1973; Deputy Director, Dryden Flight Research Center, Edwards, Calif., August 1973–April 1975; appointed Center Director 1975; resigned from NASA, October 1977. President, Scott Science & Technology, Inc., Lancaster, Calif.
- SEDDON, Margaret R.** (Nov. 8, 1947, Murfreesboro, Tenn.) — Civilian; B.A. (physiology), M.D.; flight, mission specialist; Group 8, August 1979.
- SEE, Elliott M. Jr.** (July 23, 1927, Dallas, Texas) — Civilian; B.S. from the U.S. Merchant Marine Academy, M.S. (engineering); deceased; Group 2, September 1962; died in T-38 crash with Charles Bassett, Feb. 28, 1966, Lambert Municipal Airport, St. Louis.
- SHAW, Brewster H. Jr.** (May 16, 1945, Cass City, Mich.) — Major, USAF; B.S. and M.S. (engineering mechanics); flight, pilot; Group 8, August 1979; designated pilot for STS-9 (Spacelab 1).
- SHEPARD, Alan B. Jr.** (Nov. 18, 1923, East Derry, N.H.) — Rear Admiral, USN (Ret.); B.S., U.S. Naval Academy; Group 1, April 1959; Mercury 3, Apollo 14; resigned from NASA and retired from Navy, Aug. 1, 1974. President, Windward Co., Deer Park, Texas.
- SHRIVER, Loren J.** (Sept. 23, 1944, Jefferson, Iowa, but considers Paton, Iowa to be his hometown) — Major, USAF; B.S. (aeronautical engineering), M.S. (astronautical engineering); flight, pilot; Group 8, August 1979; designated to serve as pilot for STS-10.
- SLAYTON, Donald K.** (March 1, 1924, Sparta, Wis.) — Major; USAF (Reserve); B.S. (aeronautical engineering); Group 1, April 1959; Apollo-Soyuz Test Project; was Manager for Orbital Flight Tests, Space Shuttle Program Office, Johnson Space Center; retired from NASA, February 1982. Vice Chairman of the Board, Space Services, Inc., and a consultant to aerospace corporations.
- SMITH, Michael J.** (April 30, 1945, Morehead City, N.C.) — Commander, USN; B.S. (naval science), M.S. (aeronautical engineering); flight, pilot; Group 9, August 1981.
- SPRING, Sherwood C.** (Sept. 3, 1944, Hartford, Conn., but considers Harmony, R.I., his hometown) — Major, USA; B.S. (general engineering), M.S. (aerospace engineering); flight, mission specialist; Group 9, August 1981.

- SPRINGER, Robert C.** (May 21, 1942, St. Louis, Mo., but considers Ashland, Ohio, his hometown) — Lt. Colonel, USMC; B.S. (naval science), M.S. (operations research and systems analysis); flight, mission specialist; Group 9, August 1981.
- STAFFORD, Thomas P.** (Sept. 17, 1930, Weatherford, Okla.) — Lieutenant general, USAF (Ret.); B.S. from the U.S. Naval Academy; Group 2, September 1962; Gemini 6, Gemini 9, Apollo 10, Apollo-Soyuz Test Project; resigned from NASA, November 1975 and retired from Air Force, Nov. 1, 1979. Vice Chairman, Gibraltar Exploration, Ltd., Oklahoma City.
- STEWART, Robert L.** (Aug. 13, 1942, Washington, D.C. but considers Arlington, Texas, his hometown) — Lieutenant colonel, USA; B.S. (mathematics), M.S. (aerospace engineering); flight, mission specialist; Group 8, August 1979; selected to serve as a mission specialist on STS-11.
- SULLIVAN, Kathryn D.** (Oct. 3, 1951, Paterson, N.J., but considers Woodland Hills, Calif., her hometown) — Civilian, B.S. (earth sciences), Ph.D. (geology); flight, mission specialist; Group 8, August 1979.
- SWIGERT, John L. Jr.** (Aug. 30, 1931, Denver, Colo.) — Civilian; B.S. (mechanical engineering), M.S. (aerospace science), M.B.A.; Group 5, April 1966; Apollo 13; resigned from NASA, July 1978. Staff Director, Committee on Science and Astronautics, House of Representatives, April 1973-September 1977. In November 1982, won the new seat for Colorado's Sixth Congressional District; died of complications from cancer in Washington, Dec. 27, 1982, a week before he would have taken the congressional seat he won in the November election.
- THAGARD, Norman E.** (July 3, 1943, Marianna, Fla., but considers Jacksonville, Fla., his hometown) — Civilian; B.S. and M.S. (engineering science), M.D.; flight, mission specialist; Group 8, August 1979; mission specialist on STS-7, June 18-24, 1983; designated a mission specialist for STS-18 (Spacelab 3).
- THORNTON, William E.** (April 14, 1929, Faison, N.C.) — Civilian; B.S. (physics), M.D.; flight, mission specialist; Group 6, August 1967; selected to serve as a mission specialist for STS-8 and STS-18 (Spacelab 3).
- TRULY, Richard H.** (Nov. 12, 1937, Fayette, Miss.) — Captain; USN; B.S. (aeronautical engineering); flight, pilot; Group 7, August 1969; piloted Enterprise Space Shuttle free-flight approach and landing tests 2 and 4 on Sept. 13 and Oct. 12, 1977; pilot on STS-2 Nov. 12-14, 1981; designated spacecraft commander for STS-8.
- VAN HOF TEN, James D.** (June 11, 1944, Fresno, Calif., but considers Burlingame, Calif., his hometown) — Civilian; B.S. (civil engineering), M.S. (hydraulic engineering) and Ph.D. (fluid mechanics); flight, mission specialist; Group 8, August 1979; selected to serve as a mission specialist on STS-13.
- WALKER, David M.** (May 20, 1944, Columbus, Ga., but considers Eustis, Fla., his hometown) — Commander, USN; B.S. from the U.S. Naval Academy; flight, pilot; Group 8, August 1979.
- WEITZ, Paul J.** (July 25, 1932, Erie, Pa.) — Captain; USN (Ret.); B.S. and M.S. (aeronautical engineering); flight, pilot; Group 5, April 1966; Skylab 2; retired from Navy, June 1976; commander of STS-6, April 4-9, 1983.

WHITE, Edward H. II (Nov. 14, 1930, San Antonio, Texas) — Lieutenant colonel, USAF; B.S. from the U.S. Military Academy, M.S. (aeronautical engineering); deceased; Group 2, September 1962; Gemini 4; died in Apollo spacecraft fire at Kennedy Space Center Jan. 27, 1967.

WILLIAMS, Clifton C. Jr. (Sept. 26, 1932, Mobile, Ala.) — Major, USMC; B.S. (mechanical engineering); deceased; Group 3, October 1963; died in T-38 crash near Tallahassee, Fla., Oct. 5, 1967.

WILLIAMS, Donald E. (Feb. 13, 1942, Lafayette, Ind.) — Commander, USN; B.S. (mechanical engineering); flight, pilot; Group 8, August 1979.

WORDEN, Alfred M. (Feb. 7, 1932, Jackson, Mich.) — Colonel, USAF (Ret.); B.S. (military science) from the U.S. Military Academy, M.S. (astronautical/aeronautical engineering and instrumentation engineering); Group 5, April 1966; Apollo 15; 1972-1973 Senior Aerospace Scientist, Ames Research Center, Mountain View, Calif.; 1973-1975, Chief, Systems Studies Division at Ames; resigned from Air Force and NASA, September 1975. President, Alfred M. Worden, Inc., Palm Beach Gardens, Fla.

YOUNG, John W. (Sept. 24, 1930, San Francisco, Calif.) — Captain, USN (Ret.); B.S. (aeronautical engineering); flight, pilot; Group 2, September 1962; retired from Navy in September 1976; Gemini 3, Gemini 10, Apollo 10, Apollo 16, STS-1; Chief, Astronaut Office, Johnson Space Center, Houston; commander on STS-1, April 12-14, 1981; designated as commander STS-9 (Spacelab 1).



25th Anniversary
1958-1983

FINE ARTS PROGRAM

Fine Arts Program

NASA ART PROGRAM

by

Sarah G. Keegan

Following a tradition dating from the days of Valley Forge and the Civil War period, contemporary artists in the NASA Art Program are providing an archival record of a significant aspect of American history.

These artists are on the scene at fiery launch pads and desert landing sites, vying for space with wire service reporters and network camera crews, to capture their impressions of events in the U.S. space program.

In the early days of NASA it was known that space activities would be documented widely in still photographs and motion pictures. James E. Webb, NASA's second Administrator, saw the need, though, to record the "spirit as well as the sights of the space age."

The NASA Art Program was instituted at Webb's recommendation in 1962 with the goals of collecting a unique documentation of America's advance into space and providing a special contribution to the history of American art. Advice was furnished by Dr. Lester H. Cooke, then-curator of painting at the National Gallery of Art.

Nationally known artists were invited to visit NASA sites and record their perceptions in drawings and paintings, which would then be donated to the government.

The first event to which artists were dispatched was Gordon Cooper's final Mercury flight in May 1963. The artists covered the activity side-by-side with news media representatives; seven artists were assigned to Cape Canaveral and one witnessed the capsule recovery in the Pacific.

One month later NASA received a group of 60 preliminary sketches. The set included pen and ink working sketches and charcoal and wash drawings. Each conveyed the impressions of the individual artist from his particular vantage at the launch or recovery site.

As Robert Schulman, the present director of the NASA Art Program recalls: "NASA made it possible for selected artists to be present at Cape Canaveral as astronauts suited up for their flights and were launched into space, and they were at Houston Mission Control during the moon landing. Artists were aboard recovery ships when the astronauts returned to earth from their long voyages. Artists have piloted Lunar Module simulators to make-believe moons. In short NASA has tried to provide them every possible view and experience."

The visual documentation of space activities continued through the Gemini and Apollo programs. Such well-known figures as Norman Rockwell, James Wyeth and Robert Rauschenberg added their own perceptions to the burgeoning archives of America's advance into space.

The NASA Art Program waned with the decline of manned space flight activities after the Apollo program, until 1977 when Schulman was asked to revive it. The reason -- the advent of a new era in the U.S. adventure in space -- the age of the Space Shuttle.

Makeshift easels and sketch pads began appearing on NASA sites again during the free flight phase of the Shuttle Approach and Landing Tests. By the time of the first Space Shuttle launch in April 1981, the art program was back in full swing. For that flight, seven artists were on hand at the launch site and three awaited the spaceship's return in California's Mojave Desert.

The group of about 40 artists who have participated in the art program since its renewal during the Shuttle development period covers the spectrum of artistic fame and styles. Some of the artists' names are household words; others are known mainly in the areas where the artists live and work. The style of their work ranges from the strictly representational to the abstract, from near-photographic realism to the bold strokes of luminous color more typical of impressionism.

Currently five artists are dispatched to each Shuttle launch: one is permitted in the room with the astronauts while they are suiting up and others are scattered around the pad at various sites. Smaller teams attend the landings.

Some artists crowd into prelaunch press conferences to view the Shuttle program from this perspective. Others troop through aerospace plants between missions to acquire that part of the Shuttle experience.

Each artist receives a \$1,500 honorarium to cover the expenses of attending an event. In return, NASA receives all on-site sketches and one major work inspired by the visit.

Obviously it is not the pay that attracts artists to the program. As Schulman notes: "After their first night at a launch, they're so excited they would work for nothing. They want to feel they are making a personal artistic contribution to the Shuttle era."

At present NASA is considering the possibility of carrying private citizens as space is available on future Shuttle flights. Recommendations of an advisory group suggest flying observers who could effectively communicate the experience, and thus carry out NASA's mandate to disseminate widely information on its activities.

Schulman, an artist himself, is enthusiastic about this issue's potential effect on the NASA Art Program. "I'm looking forward to the day when they call me up and tell me to get an artist team ready for the next trip to the space station," he says. "You know what? I'll go."

A major collection of almost 100 works documenting the history of the Shuttle era has been on display at the National Air and Space Museum in Washington, D.C., since last December. The paintings cover the period from the 1977 Approach and Landing Tests to the November 1982 touchdown of the fifth Shuttle mission.

The exhibit, titled "The Artist and the Space Shuttle," includes works of 40 American artists, among whom are Robert McCall, Lamar Dodd, Jack Perlmutter, Robert Rauschenberg, Arthur Shilstone and Henry Casselli. Interestingly, McCall and Dodd have been involved in the NASA Art Program since its inception: both covered Cooper's 1963 Mercury flight.

The Shuttle art display will leave the National Air and Space Museum in September for a national tour, which is being arranged by the Smithsonian Institution Traveling Exhibition Service. The first stop will be the University of Houston at Clear Lake in Texas where the collection will be featured from Oct. 15 through Nov. 27.

The NASA Art Program, as exemplified by this collection, continues to serve as a vehicle to garner a unique archives of one of America's most exciting periods. Each artist's personal vision of an event is conveyed in his or her particular style and becomes a part of this documentary history of the space age.

As pointed out by Cooke, as he guided the establishment of the NASA Art Program: "Perhaps this project will help prove - that the U.S. produced ... not only the engineers and scientists capable of shaping the destiny of our age but also the artists worthy to keep them company."

(A list of artists who have participated in the NASA Art Program through the eighth Shuttle mission is attached.)

**ARTISTS PARTICIPATING IN THE NASA ART PROGRAM
THROUGH THE EIGHTH SHUTTLE MISSION**

Paul Arlt
Chesley Bonestell
Neil Boyle
J. Robert Burnell
Paul Calle
Henry Casselli
Vincent Cavallaro
Ron Cobb
Alan E. Cober
Mario Cooper
Hans Cremers
Jim Cunningham
James Dean
Leonard Dermott
Carol Dick
Lamar Dodd
Bart Doe
Maria Epes
Julio Fernandez
Fred Freeman
Dennis Frings
Nick Galloway
Gay Glading
Frank Germain
Sheila Hamanaka
Theodore Hancock
Attila Hejja
James P. Hendricks
Martin Hoffman
Peter Hurd
Wilson Hurley
Billy Morrow Jackson
Chrystal Jackson
Mitchell Jamieson
Chet Jezierski
Susan Kaprov
L. Katzen
Michael Kendall
Chris Kenyon
Yeffe Kimball
Dong Kingman
Howard Kowlow
Francis J. Kraszyk
Morton Kunstler
Hugh Laidman
Sara Larkin

Ingrid Leeds
Fletcher Martin
Alfred McAdams
M. McCaffrey
Robert McCall
John W. McCoy II
Franklin McMahon
Mark McMahon
John Meigs
Fred Messersmith
Dale Meyers
Pierre Mion
Greg Mort
Lowell Nesbitt
Tom Newsom
Andreas Nottebohm
Tom O'Hara
Jack Perlmutter
Ludek Pesek
Bill Phillips
John Pike
Jerry Pinkney
Henry C. Pitz
Clayton Pond
Robert Rauschenberg
Linda R. Richards
Bill Robles
Norman Rockwell
Paul Salmon
Paul Sample
Charles Schmidt
Miriam Schottland
Robert Schulman
Arthur Shilstone
Robert Shore
Nicholas Solovioff
Tracy Sugarman
Walter Taylor
William Thon
George Weymouth
Alden Wicks
Ren Wicks
John Willenbecher
William Woodward
Frank Wright
James Wyeth



25th Anniversary
1958-1983

SPECIAL QUOTES

Special Quotes

**SIGNIFICANT QUOTATIONS FROM NASA'S
FIRST 25 YEARS**

Compiled by
Stuart W. Rosenbaum

Robert H. Goddard
"The Father of Modern Rocketry"

"It is difficult to say what is impossible for the dream of yesterday is the hope of today and the reality of tomorrow."

T. Keith Glennan
First NASA Administrator, 1958.
Commenting on Project Mercury.

"Let's get on with it."

President John F. Kennedy
May 21, 1961
Excerpts from his Address to the Congress.

"Space is open to us now, and our eagerness to share its meaning is not governed by the efforts of others... we go into space because whatever mankind must undertake; free men must fully share.

"...I believe that this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to the earth. No single space project in this period will be more impressive to mankind or more important to the long-range exploration of space...

"In a very real sense it will not be one man going to the moon; if we make this judgement affirmatively, it will be an entire nation...if we are to go only half-way or reduce our sights in the face of difficulty, in my opinion it would be better to not go at all...

"...For while we cannot guarantee that one day we shall be first, we can guarantee that any failure to make this effort will surely make us last..."

Mercury Redstone 3

May 5, 1961

Alan Shepard, America's first man in space.

"Roger, lift-off and the clock has started..."

Apollo 8.

Dec. 21-27, 1968.

Astronauts Frank Borman, James Lovell, William Anders.

First human lunar orbital flight. Dec. 24, 1968.

Borman: "The crew of Apollo 8 has a message that we would like to send to you.

Anders: "In the beginning God created the Heaven and the earth. And the earth was without form and void and darkness was upon the face of the deep. And the spirit of God moved upon the face of the waters and God said, let there be light. And there was light. And God saw the light and that it was good and God divided the light from the darkness.

Lovell: "And God called the light day and the darkness he called night. And the evening and the morning were the first day. And God said, let there be a firmament in the midst of the waters. And let it divide the waters from the waters. And God made the firmament and divided the waters which were above the firmament. And it was so. And God called the firmament Heaven and evening and morning were the second day.

Borman: "And God said let the waters under the Heavens be gathered together in one place. And the dry land appear. And it was so. And God called the dry land earth. And the gathering together of the waters called he seas. And God saw that it was good.

"And from the crew of Apollo 8, we pause with good night, good luck, a Merry Christmas and God Bless all of you, all of you on the good earth.

Apollo 11.

July 16-24, 1969.

Astronauts Neil A. Armstrong, Buzz Aldrin, Michael Collins.

First words from Tranquility Base, first manned lunar landing, 5:18 p.m., EDT

Capcom: (Charles Duke)"We copy you down Eagle."

Eagle: "Tranquility base here, the Eagle has landed."

Capcom: "Tranquility, we copy you on the ground. You've got a bunch of guys about to turn blue. We're breathing again, thanks a lot."

Apollo 11.

July 20, 1969

Neil Armstrong's first words upon stepping on the surface of the moon.

"That's one small step for a man, one giant leap for mankind."

Apollo 11.

July 20, 1969

Lunar Module Pilot Buzz Aldrin comments on scenery on the moon.

"Magnificent desolation."

Apollo 11.

July 20, 1969

President Richard M. Nixon speaks to astronauts Aldrin and Armstrong by phone.

"For one priceless moment in history, the world is truly one; one in our pride and admiration in what you have done, and one in our hopes and prayers that you will safely return to us."

Apollo 13.

April 11 - 17, 1970

Astronauts: James A. Lovell, Fred W. Haise John L. Swigert

Apollo 13 was the first space mission to experience an emergency in space. Command Module Pilot Jack Swigert gave the first intimation of serious trouble for Apollo 13, 200,000 miles from earth when a cryogenic oxygen tank exploded, crippling the mission.

" Hey, we've got a problem here."

Skylab 4

Nov. 16, 1973 - Feb. 8, 1974.

Astronauts Gerald Carr, Edward Gibson and William Pogue manned Skylab space station for 84 days.

Edward Gibson makes an observation about earth.

"Being up here and being able to see the stars and look back at the earth and see your own sun as a star makes you ... realize the universe is quite big, and just the number of possible combinations... which can create life enters your mind and makes it seem much more likely."

William Pogue comments on life on earth:

"I now have a new orientation... of almost a spiritual nature. My attitude towards life and towards my family is going to change. When I see people, I try to see them as operating human beings and try to fit myself into a human situation instead of trying to operate like a machine."

STS-1

April 12, 1981.

Astronauts John Young and Robert Crippen man America's first Space Shuttle "Columbia" on its first space flight.

"The dream is alive again."

STS-4

June 27-July 4, 1982

President Ronald Reagan comments upon the conclusion of the fourth and final test flight of the space shuttle "Columbia", piloted by Thomas Mattingly and Henry Hartsfield.

" In the future, as in the past, our freedom, independence and national well-being will be tied to new achievements, new discoveries and pushing back frontiers. The fourth landing of the Columbia is the historical equivalent to the driving of the golden spike which completed the first transcontinental railroad. It marks our entrance into a new era. The test flights are over, the groundwork has been laid, now we will move forward to capitalize on the tremendous potential offered by the ultimate frontier of space..."

"... We also honor two pathfinders. They reaffirm to all of us that as long as there are frontiers to be explored and conquered, Americans will lead the way. They and the other astronauts have shown the world that Americans still have the know-how and Americans still have the true grit that tamed a savage wilderness."

STS-5

Nov. 11-16, 1982

Astronauts Vance Brand, Robert Overmyer, Joseph Allen and William Lenoir comment on deployment of Satellite Business System's satellite SBS-3.

" We deliver."



25th Anniversary
1958-1983

Administrator Biogs

ADMINISTRATOR BIOGS

NASA ADMINISTRATORS

by
Barbara E. Selby

Six administrators have guided the National Aeronautics and Space Administration in its 25-year history.

The NASA Administrator is charged with responsibility for all functions and authorities assigned to the agency. The Deputy Administrator is the Administrator's principal assistant acting under delegations of authority and assignments of responsibility from the Administrator. During the Administrator's absence the Deputy Administrator serves as Acting Administrator.

T. KEITH GLENNAN First Administrator of NASA (Aug. 19, 1958 — Jan. 20, 1961)

T. (Thomas) Keith Glennan became the first Administrator of the National Aeronautics and Space Administration, established Oct. 1, 1958, under the National Aeronautics and Space Act of 1958. He served in this position until Jan. 20, 1961.

As Administrator, Glennan headed a staff of scientists, engineers, technicians and other employees engaged in research and development in aeronautics and space matters. In this position he was a member of the President's National Aeronautics and Space Council.

Glennan was president-on-leave of the Case Institute of Technology, Cleveland, Ohio, which he had headed since 1947.

Born in Enderlin, N.D., in 1905, Glennan earned a degree in electrical engineering from the Sheffield Scientific School of Yale University in 1927.

Following graduation, Glennan became associated with the newly developed sound motion picture industry, and later became assistant general service superintendent for Electrical Research Products Co., a subsidiary of Western Electric Co. During his career he was studio manager of Paramount Pictures, Inc., and Samuel Goldwyn Studios, and was briefly on the staff of Vega Airplane Corp.

Glennan joined the Columbia University Division of War Research in 1942, serving through the war, first as Administrator and then as Director of the U.S. Navy's Underwater Laboratories at New London, Conn. For his work he was awarded the Medal of Merit.

At the end of World War II, Glennan became an executive of Ansco, Binghamton, N.Y. From this position he was named president of Case. During his 11-year administration, Case rose from a primarily local institution to rank with the top engineering schools in the nation. From October 1950 to November 1952, concurrent with his Case presidency, he served as a member of the Atomic Energy Commission.

Active in national and civic affairs, Glennan was chairman of the board of the Institute of Defense Analysis, on the board of the National Science Foundation, and the Council on Financial Aid to Education. In Cleveland he took an important part in many civic activities.

Glennan is a Fellow of the American Academy of Arts and Sciences, and a member of Sigma Xi, Tau Beta Phi and Chi Phi. He has been awarded several honorary doctorate degrees.

Glennan is married to the former Ruth Haslup Adams. They have four children.

After leaving NASA, Glennan returned as President from his leave of absence at the Case Institute of Technology, Cleveland. His service extended from 1947-69. From 1970 to 1973, he served as the U.S. Representative, with the rank of Ambassador, to the International Atomic Energy Agency, Vienna, Austria. Although retired, Glennan presently serves on numerous boards.

JAMES E. WEBB

Second Administrator of NASA
(Feb. 14, 1961 - Oct. 8, 1968)

James Edwin Webb served as NASA's second Administrator from Feb. 14, 1961, to Oct. 8, 1968.

In addition to his distinguished service as Administrator, Webb had held other important positions in government. Early in his career he served as secretary to Congressman Edward W. Pou of North Carolina, who was Chairman of the House Rules Committee. Immediately after World War II he was successively Executive Assistant to the Under Secretary of the Treasury, Director of the U.S. Bureau of the Budget and Under Secretary of State. During and since his service as Administrator of NASA he has served in numerous government commissions, committees and panels.

In the business world, Webb has served as Personnel Director, Treasurer and Vice President of the Sperry Gyroscope Co., and as a director of Sperry Rand Corp.; as President of the Republic Supply Co.; as Assistant to the President of Kerr-McGee Corp. and as a director of that company; as a director of Gannett Co., Inc., Rochester, N.Y.; and of McGraw-Hill, Inc., New York City. He is currently a director of Computer Data Systems, Inc., Washington, D.C. and of Kerr Consolidated, Oklahoma City, Okla.

In the area of public service, Webb is a Trustee of the National Geographic Society, of the Kerr Foundation and is a Regent of the Smithsonian Institution.

He has received numerous awards and honors, including the Presidential Medal of Freedom, the Gardner Greene Hubbard-National Geographic Society Medal, the Oklahoma State University Bennett Medal, the Robert H. Goddard Memorial Trophy, the Collier Trophy, the General Accounting Office Award for Public Service, the North Carolina Public Service Award and U.S. Military Academy's Sylvanus Thayer Award.

He is a member of the Oklahoma Hall of Fame, the American and District of Columbia Bar Associations, the National Academy of Public Administration, American Judicature Society, the American Astronautical Society and the International Academy of Astronautics.

Webb's military service, active and reserve, spanned 37 years. From 1930 to 1932 he was on active duty first as a student and then as a naval aviator with the Marine Corps. There followed 12 years of reserve duty as a junior officer in the Marine Corps before he returned to active duty during World War II as a major. He returned to the Marine Corps reserve in 1950 as a lieutenant colonel, in which role he served until 1966, when he retired.

Born in Granville County, N.C., Oct. 7, 1906, Webb attended Oxford High School, Oxford, N.C. He received a bachelor's degree in education from the University of North Carolina in 1928. He studied law at George Washington University and was admitted to the Bar of the District of Columbia in 1936.

Webb is married to the former Patsy Aiken Douglas. They have two children, Sarah Gorham and James Edwin Jr.

Since his retirement from NASA, Webb has been engaged in legal work with an office in Washington and in the preparation of his papers which he has given to the Truman Library in Independence, Mo.

THOMAS O. PAINE
Third Administrator of NASA
(March 21, 1969 - Sept. 15, 1970)

Dr. Thomas O. Paine was appointed Deputy Administrator of NASA on Jan. 31, 1968. Upon the retirement of James E. Webb on Oct. 8, 1968, he was named Acting Administrator of NASA. He was nominated as NASA's third Administrator March 5, 1969, and confirmed by the Senate on March 20, 1969.

During his leadership the first seven Apollo manned missions were flown, in which 20 astronauts orbited the earth, 14 traveled to the moon and four walked upon its surface. Many automated scientific and applications spacecraft were also flown in United States and cooperative international programs.

Paine resigned from NASA Sept. 15, 1970, to return to the General Electric Co. in New York City as Vice President and Group Executive, Power Generation Group, where he remained until 1976.

Paine began his career as a research associate at Stanford University from 1947 to 1949, where he made basic studies of high-temperature alloys and liquid metals in support of naval nuclear reactor programs. He joined the General Electric Research Laboratory in Schenectady, N.Y., in 1949 as research associate, where he initiated research programs on magnetic and composite materials. In 1951, he transferred to the Meter and Instrument Department, Lynn, Mass., as manager of materials development, and later as laboratory manager. Under Paine's management the laboratory received the 1956 Award for Outstanding Contribution to Industrial Science from the American Association for Advancement of Science for its work in fine-particle magnet development.

From 1958 to 1962, Paine was research associate and manager of Engineering Applications at G.E.'s Research and Development Center in Schenectady. From 1963 to 1968 he was manager of TEMPO, G.E.'s Center for Advanced Studies in Santa Barbara, Calif.

Paine's professional activities have included chairmanship of the 1962 Engineering Research Foundation - Engineers Joint Council Conference on Science and Technology for Less Developed Nations; secretary and editor of the E.J.C. Committee on the Nation's Engineering Research Needs 1965-1985; member, Advisory Committee and local chairman, Joint American Physical Society - Institute of Electrical and Electronics Engineers International Conference on Magnetism and Magnetic Materials; chairman, Special Task Force for U.S. Department of Housing and Urban Development; Advisory Board, AIME "Journal of Metals;" member, Basic Science Committee of IEEE, Research Committee of the Stanford University School of Engineering, and Board of Scientific Advisors of the Quarterly Journal "Research Policy." He is a member of numerous professional societies.

Paine was born in Berkeley, Calif., Nov. 9, 1921, son of Commodore and Mrs. George T. Paine, USN (Ret.). He attended public schools in various cities and was graduated from Brown University in 1942 with a bachelor's degree in engineering. From 1946-49 Paine attended Stanford University, receiving his master's degree in 1947 and doctorate in physical metallurgy. He has received honorary doctor of science degrees from Brown University, Clarkson College of Technology, Nebraska Wesleyan University, the University of New Brunswick (Canada), Oklahoma City University, and an honorary doctor of engineering degree from Worcester Polytechnic Institute.

In World War II he served as a submarine officer in the Pacific and in the Japanese occupation. He qualified in submarines and as a Navy deep-sea diver and was awarded the Commendation Medal and Submarine Combat Insignia with Stars.

Paine is married to the former Barbara Helen Taunton Pearse of Perth, Western Australia. They have four children: Marguerite Ada, George Thomas, Judith Janet and Frank Taunton.

Paine is now president of Thomas Paine Associates High Tech Consulting Co., Los Angeles, Calif.

JAMES C. FLETCHER

Fourth Administrator of NASA
(April 27, 1971 - May 1, 1977)

Dr. James C. Fletcher became Administrator of NASA on April 27, 1971. He was the fourth man to head the nation's civilian space agency.

Fletcher began his career as a research physicist with the U.S. Navy Bureau of Ordnance. He became a special research associate at Cruft Laboratory, Harvard University. In 1942 he became an instructor at Princeton University.

In 1948, Fletcher joined the Hughes Aircraft Co. where he served for six years. Later he joined Ramo-Wooldridge Corp.'s Guided Missile Research Division which later became Space Technology Laboratories. In July 1958, with an associate Fletcher organized and was first president of the Space Electronics Corp. at Glendale, Calif., which developed and produced the Able Star stage of the Thor-Able space carrier. After a merger with a portion of Aerojet, Fletcher became President and then chairman of the newly formed Space General Corp. He later also served as Systems Vice President of Aerojet General Corp.

In 1964 he became the eighth president of the University of Utah, a post he held for seven years.

As a research scientist, Fletcher has developed patents in sonar devices and missile guidance systems. He has been associated with the President's Science Advisory Committee, nine years as a member of subcommittees and four years as a member of the Committee itself, and has served on several Presidential Task Forces and other government-industry committees.

He is a Fellow of the Institute of Electrical and Electronics Engineers, American Institute of Astronautics and Aeronautics, the American Academy of Arts and Sciences, the American Astronautical Society and was elected to the National Academy of Engineering. He was a recipient of the first Distinguished Alumni Award of the California Institute of Technology and holds an Honorary Doctorate from the University of Utah.

Fletcher was born June 5, 1919, in Millburn, N.J. He received a bachelor's degree in physics from Columbia University in 1940 and a doctorate in physics from the California Institute of Technology in 1948.

Fletcher is married to the former Fay Lee of Brigham City, Utah. They are the parents of three daughters and one son.

After leaving NASA, he became William K. Whiteford Professorship of Technology and Energy Resources at the University of Pittsburgh. He remains at this position.

ROBERT A. FROSCH

Fifth Administrator of NASA
(June 21, 1977 - Jan. 20, 1981)

Dr. Robert A. Frosch was nominated by the President on May 23, 1977, to become NASA's fifth Administrator. He took his oath of office as head of the agency and entered the new post on June 21, 1977.

Before coming to NASA, he was Associate Director for Applied Oceanography at Woods Hole Oceanographic Institution from 1975 until mid-1977.

He served as Assistant Executive Director of the United Nations Environment Program from 1973 to 1975. From 1966 to 1973, Frosch was Assistant Secretary of the Navy for research and development.

From 1963 to 1965, Frosch was director of nuclear test detection at the Defense Department's Advanced Research Projects Agency and from 1965 to 1966 he was Deputy Director of the Agency.

He joined Columbia's Hudson Laboratories in 1951, working on naval research projects as a research scientist. He became Director of Hudson Laboratories in 1956, remaining in that post until 1963.

Born May 22, 1928, in New York City, Frosch earned a bachelor's degree in 1947, a master's degree in 1949 and a doctorate in 1952 in theoretical physics, all from Columbia University in New York.

Frosch has served as Department of Defense member of the Committee for Policy Review of the National Council on Marine Resources and Engineering Development, and was chairman of the U.S. delegation to the International Oceanographic Commission meetings at UNESCO in Paris in 1967 and 1970.

He is a recipient of the Arthur S. Flemming Award, the Navy Distinguished Public Service Award, the Defense Meritorious Civilian Service Medal and the Neptune Award of the American Oceanic Organization. He is a member of Phi Beta Kappa and Sigma Xi honorary fraternities.

He is a fellow of the American Association for the Advancement of Science, the Acoustical Society of America and the Institute of Electrical and Electronics Engineers, and a member of the National Academy of Engineering, American Physical Society, Seismological Society of America, Marine Technology Society, Society of Naval Architects and Marine Engineers, Society of Exploration Geophysicists, and the American Geophysical Union.

Frosch is married to the former Jessica Rachael Denerstein of Brooklyn, N.Y. They have two daughters, Elizabeth Ann and Margery Ellen.

After leaving NASA, Frosch became President of the American Association of Engineering Societies, New York City. He is now Vice President of General Motors, General Motors Research Laboratories, Warren, Mich.

JAMES M. BEGGS

Sixth Administrator of NASA
(July 10, 1981 - Present)

James Montgomery Beggs was nominated by President Reagan on June 1, 1981 to become the sixth Administrator of NASA. He took his oath of office as head of the agency and entered the new post on July 10, 1981.

Beggs had been Executive Vice President and a director of General Dynamics Corp., St. Louis, Mo.

He served with NASA from 1968 to 1969 as Associate Administrator, Office of Advanced Research and Technology. From 1969 to 1973, he was Under Secretary of Transportation. He went to Summa Corp., Los Angeles, Calif., as Managing Director, Operations, and joined General Dynamics in January 1974. Before joining NASA, he had been with Westinghouse Electric Corp., in Sharon, Pa., and Baltimore, Md., for 13 years.

A member of the Board of Governors of the National Space Club and the American Astronautical Society, his other professional affiliations include the National Academy of Public Administration, the American Institute of Aeronautics and Astronautics, the American Society of Naval Engineers and Sigma Tau.

Beggs was born in Pittsburgh, Pa., Jan. 9, 1926. A 1947 graduate of the U.S. Naval Academy, he served with the Navy until 1954. In 1955, he received a master's degree from the Harvard Graduate School of Business Administration.

He holds honorary LL.D. degrees from Washington and Jefferson College, Washington, Pa., and Maryville College in St. Louis; an honorary doctor of engineering management degree from Embry-Riddle Aeronautical University, Daytona Beach, Fla.; an honorary doctor of science degree from the University of Alabama, and an honorary doctor of aeronautical science degree from Salem College.

Beggs is married to the former Mary Harrison. They have five children.

NASA ADMINISTRATORS, DEPUTY AND ACTING ADMINISTRATORS**Administrators**

Dr. T. Keith Glennan	Aug. 19, 1958 -- Jan. 20, 1961
James E. Webb	Feb. 14, 1961 -- Oct. 7, 1968
Dr. Thomas O. Paine*	March 21, 1969 -- Sept. 15, 1970
Dr. James C. Fletcher	April 27, 1971 -- May 1, 1977
Dr. Robert A. Frosch	June 21, 1977 -- Jan. 20, 1981
James M. Beggs	July 10, 1981 -- Present

Deputy Administrators

Dr. Hugh L. Dryden**	Aug. 19, 1958 -- Dec. 2, 1965
Dr. Robert C. Seamans Jr.	Dec. 21, 1965 -- Jan. 5, 1968
Dr. Thomas O. Paine	March 25, 1968 -- March 20, 1969
George M. Low	Dec. 3, 1969 -- June 5, 1976
Dr. Alan M. Lovelace	July 2, 1976 -- May 1, 1977
Dr. Hans Mark	July 10, 1981 -- Present

Acting Administrators

Dr. Hugh L. Dryden	Jan. 21, 1961 -- Feb. 13, 1961
Dr. Thomas O. Paine	Oct. 8, 1968 -- March 20, 1969
George M. Low	Sept. 16, 1970 -- April 26, 1971
Dr. Alan M. Lovelace	May 2, 1977 -- June 20, 1977 Jan. 20, 1981 -- July 10, 1981

*Service as Administrator or Deputy begins on the day of swearing-in. In Dr. Paine's case, although he was sworn in on April 3, 1969, his service as Administrator began on March 21, 1969 (date of appointment) because he had already taken his oath to the government when he became Deputy Administrator.

**Dr. Dryden's resignation date is date of death.



25th Anniversary
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Selected Photos

SELECTED NASA PHOTOGRAPHS 1958-1983

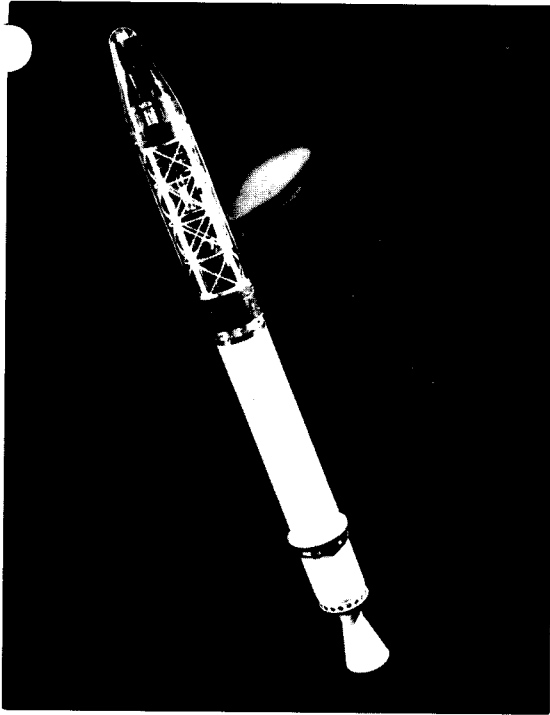
Compiled by
Dwayne C. Brown

Year	Description	B/W photo #
1958	First satellite launch	58-Explorer I
1959	Vanguard satellite	Van-25
1960	X-15 research plane	71-H-968
1960	Tiros 1 satellite	60-T-28
1961	Mercury Redstone 3	61-MR3-72B
1962	Mercury Friendship 7	62-MA6-110
1962	OSO-1 satellite	69-H-54
1962	Mariner 2	62-II-15
1963	Syncom 2	64-Syncom-C-3
1964	Ranger 7	65-H-576
1965	Gemini in orbit	65-H-2342
1965	Gemini spacewalk	78-H-760
1966	Moon surveyor	66-H-1074
1966	M2F2 "lifting body"	66-H-178
1967	Biosatellite	66-H-1618
1968	OA0 -2	63-OAO-2
1969	Apollo moon walk	69-H-1253
1971	"Supercritical wing"	71-H-480
1972	Landsat 1	72-H-672
1972	Pioneer 10	72-H-54
1973	Skylab	73-H-578

1973	Mariner 10	73-H-993
1975	Apollo-Soyuz	75-H-741
1976	Viking lander	76-H-870
1977	Voyager	77-H-155
1978	QSRA	80-H-591
1979	NOAA-6	79-H-312
1980	Solar Max	79H-583
1981	STS-1	81-H-306
1982	STS-4	82-H-486
1982	STS-4 welcomed home	82-H-490
1983	STS-7(payload shot)	83-H-533
1983	STS-7 Palapa	83-H-520
1983	Iras	83-H-78
Future	Spacelab	76-H-615
Future	Space Telescope	80-H-187
Future	Space Station	82-H-433
Future	Lunar Base	76-H-684

Color 4-by-5 inch transparencies and black-and-white 8-by-10-inch glossies are available free to information media. Transparencies are loaned for a limited period and must be returned. Non-information media may obtain identical material at a laboratory service charge through a photographic contractor. For information write: Audio Visual Branch, Public Information Division, code LFD-10, National Aeronautics and Space Administration, 400 Maryland Ave. S.W., Washington, D.C. 20546.

1958



Explorer I, launched January 31, 1958, was the first U.S. satellite.

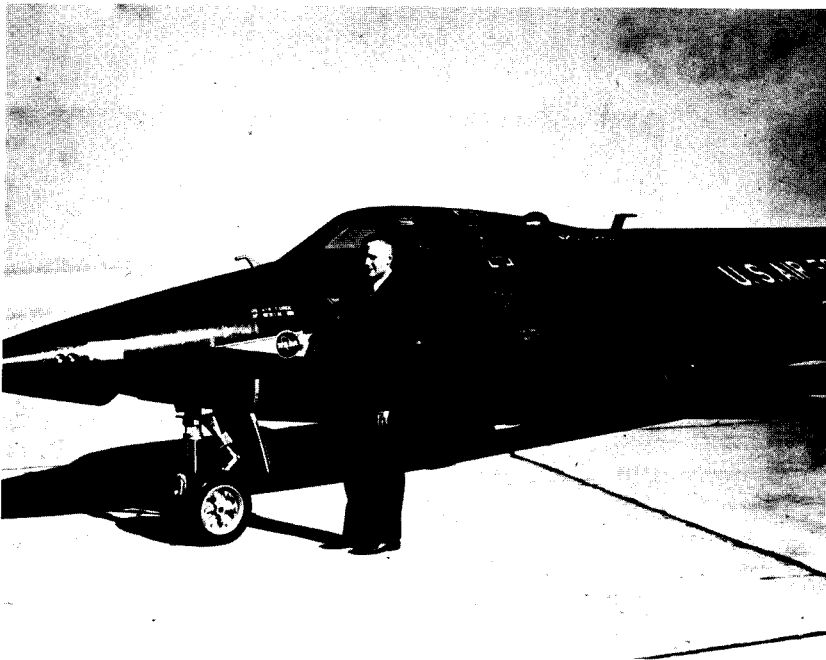
1959



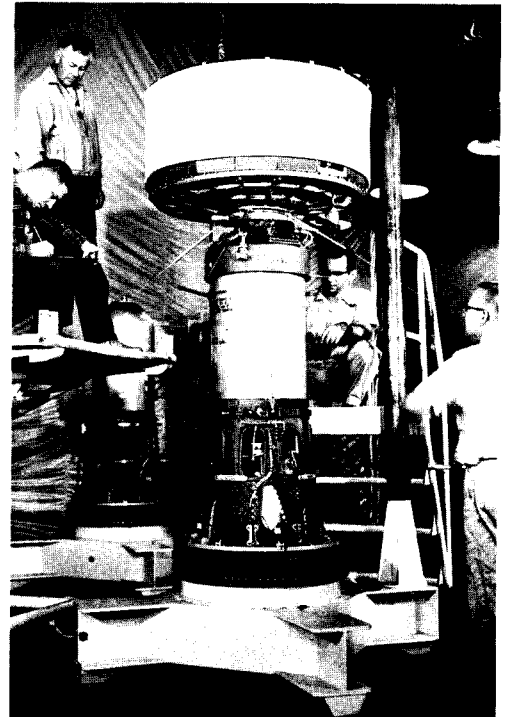
25

Vanguard (SLV-5), launched April 13, 1959, provided knowledge of earth's magnetic field.

1960

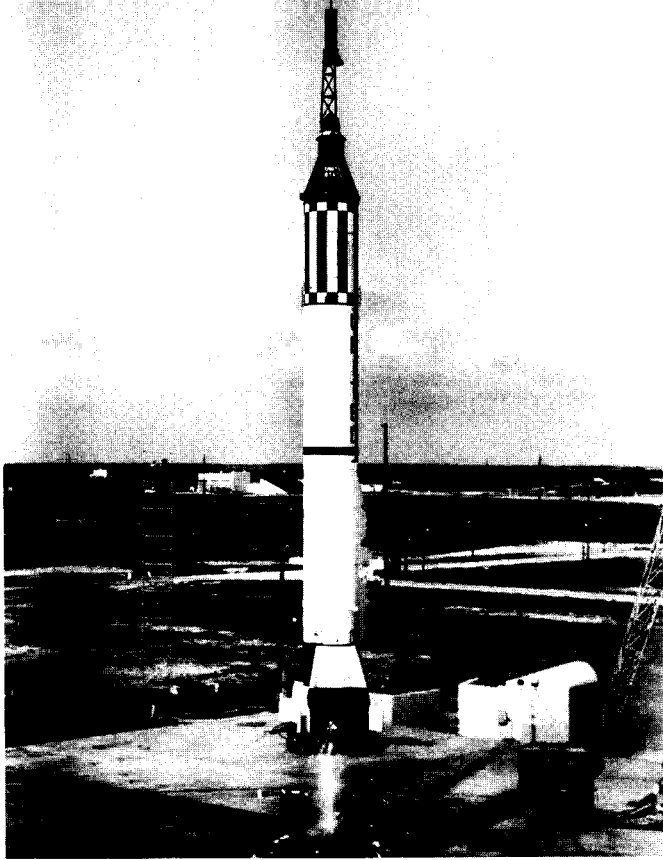


The X-15 rocket-powered research airplane provided scientific data on altitudes and speed which contributed greatly to aeronautical development.



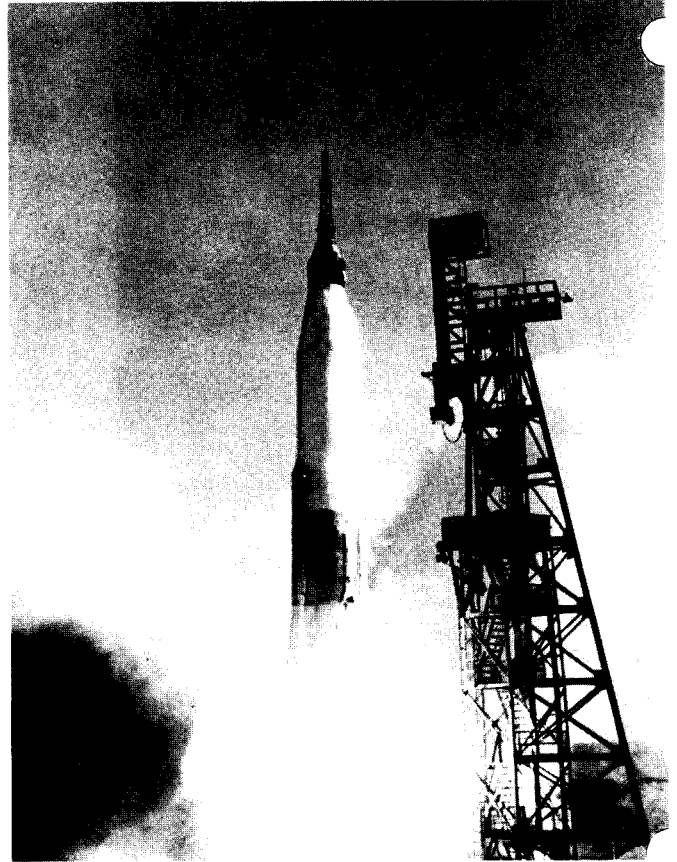
Tiros 1 was the first experimental meteorological satellite that introduced photography of earth's cloud cover from orbit.

1961



The Mercury Redstone 3 carries Alan B. Shepard and his "Freedom 7" spacecraft into suborbit marking the first U.S. manned space flight.

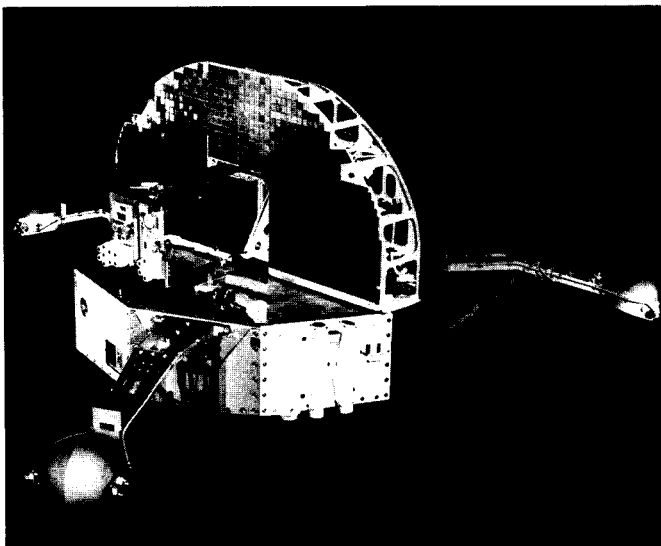
1962



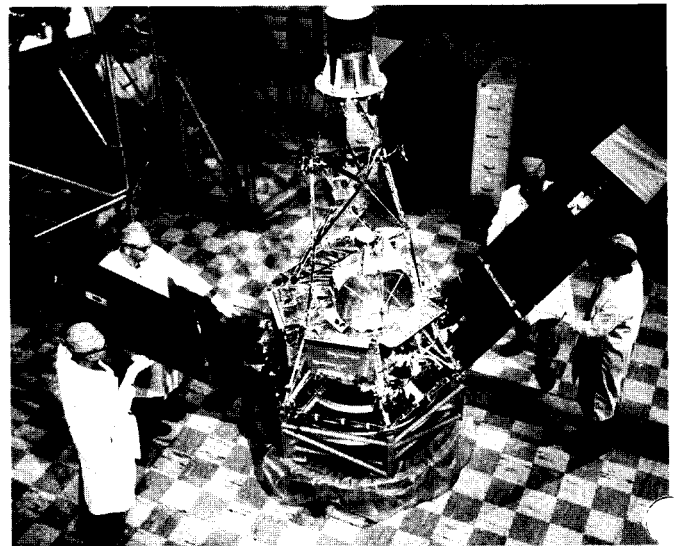
Mercury spacecraft "Friendship 7" propels astronaut John Glenn into the first U.S. manned orbital flight.

25

1962



OSO-1 was the first of the observatory class satellites monitoring solar, geophysical and astronomical studies in space.

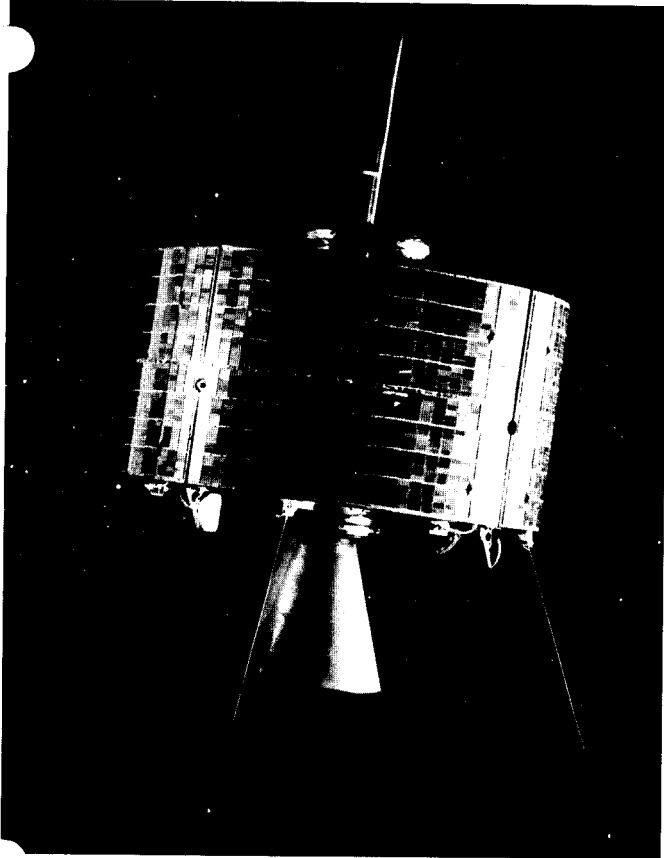


Mariner 2, pictured here in final fabrication, was the first successful planetary probe.

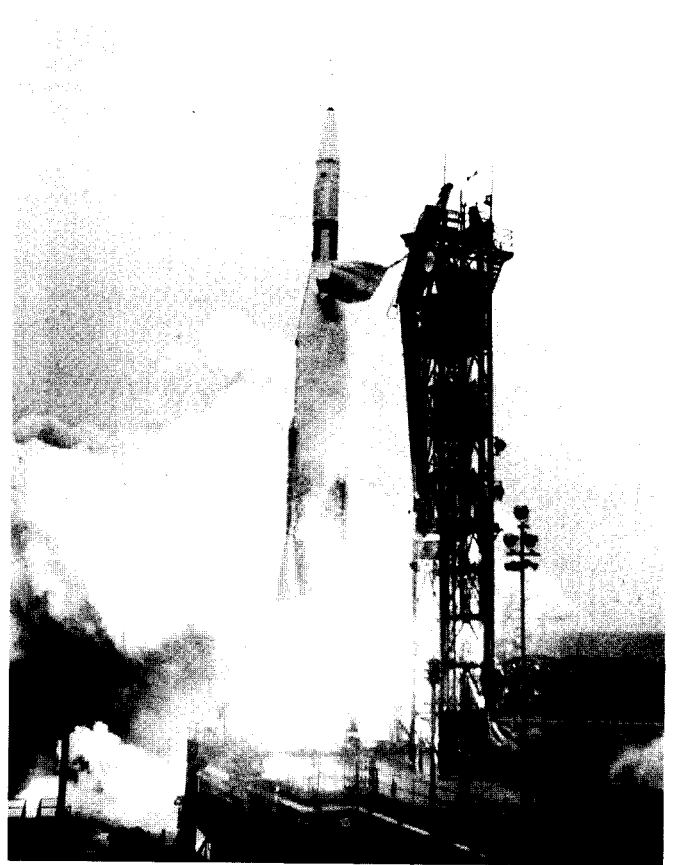
1963

O-5

1964



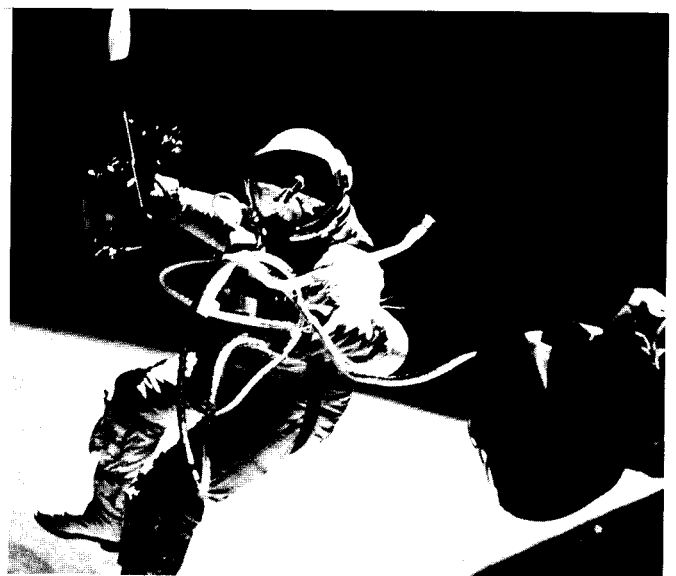
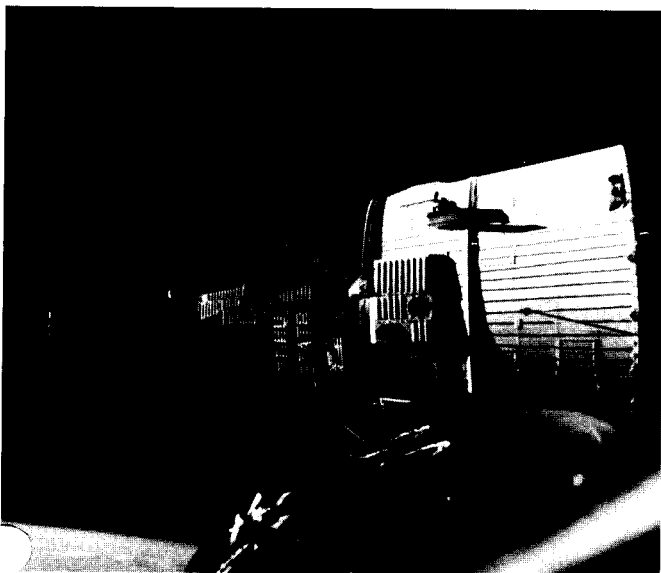
Syncom 2 provided the knowledge of communications satellites operating at synchronous orbit, building a foundation for commercial communications satellite use.



The launch of Ranger 7 was the first of its series to return photos of the moon's surface.

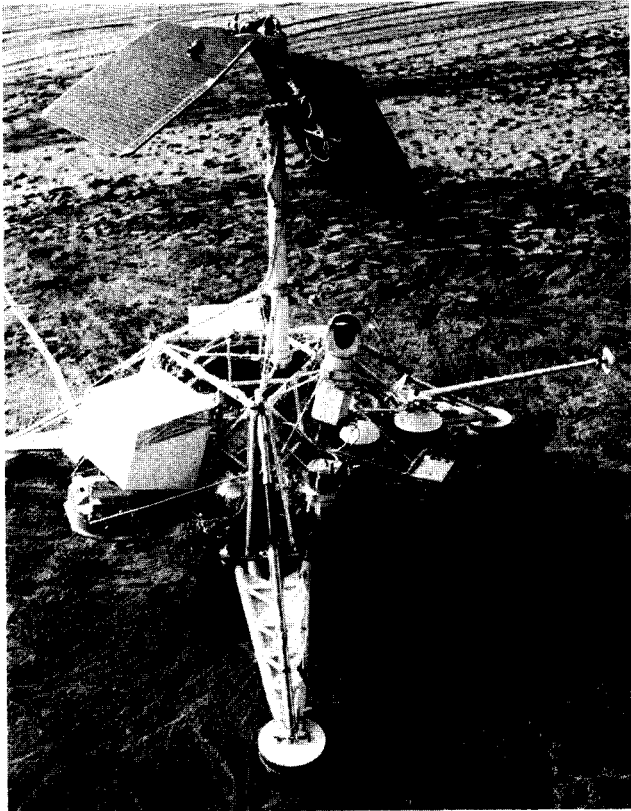
25

1965

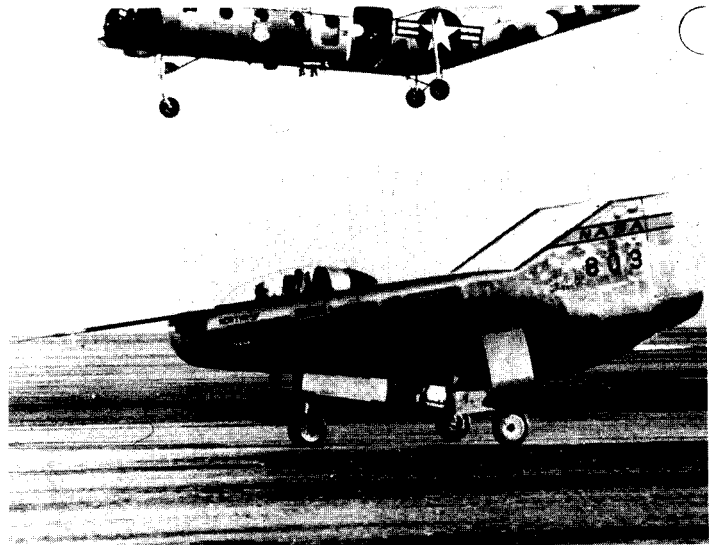


The Gemini program included the first photograph of an orbiting spacecraft and the first U.S. spacewalk.

O-6
1966



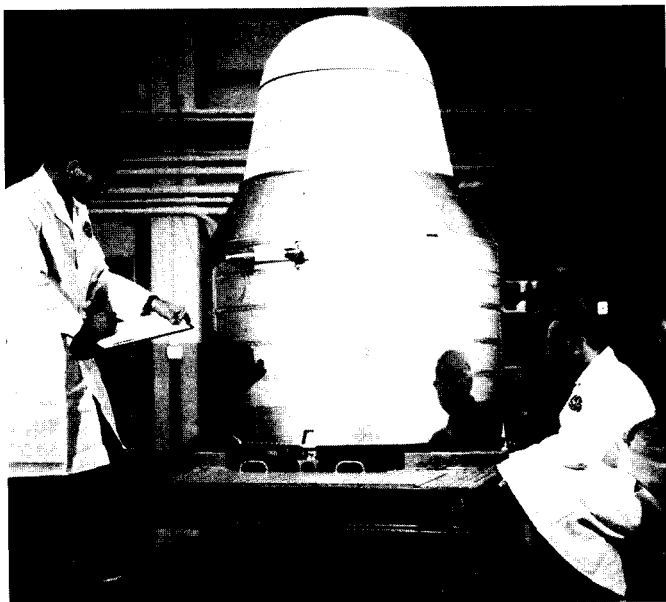
Surveyor was the first U.S. craft to land on another celestial body. It returned thousands of lunar photos to help in selecting Apollo landing sites.



The M2F2, the first of the "lifting body" vehicles, marked the beginning of a six-year program gathering data for designs of hypersonic aircraft and earth re-entering spacecraft such as the Space Shuttle.

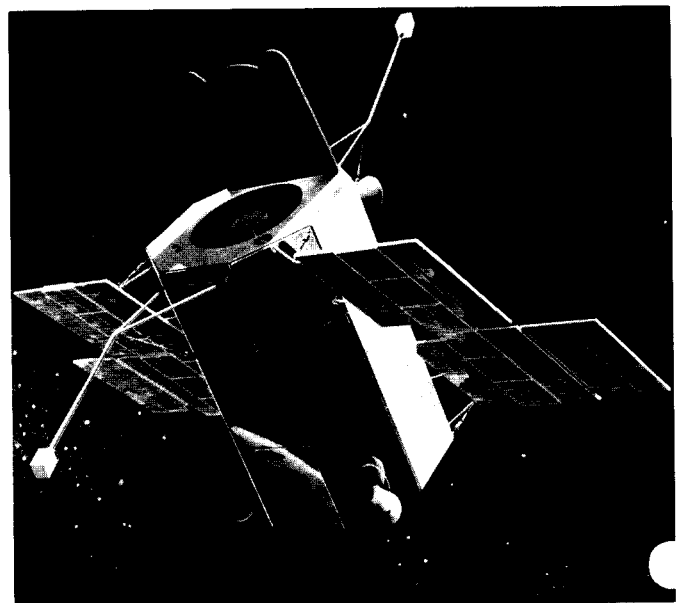
25

1967



The Biosatellite provided information on the combined weightlessness and radiation on plants, animals and their development in space.

1968



OAO-2 was the first of two successful Orbiting Astronomical Observatories that provided new data about the stars and galaxies.

1969

0-7

1971



The 70's saw the development of the "supercritical wing" allowing an airplane to fly faster or farther on the same amount of fuel.

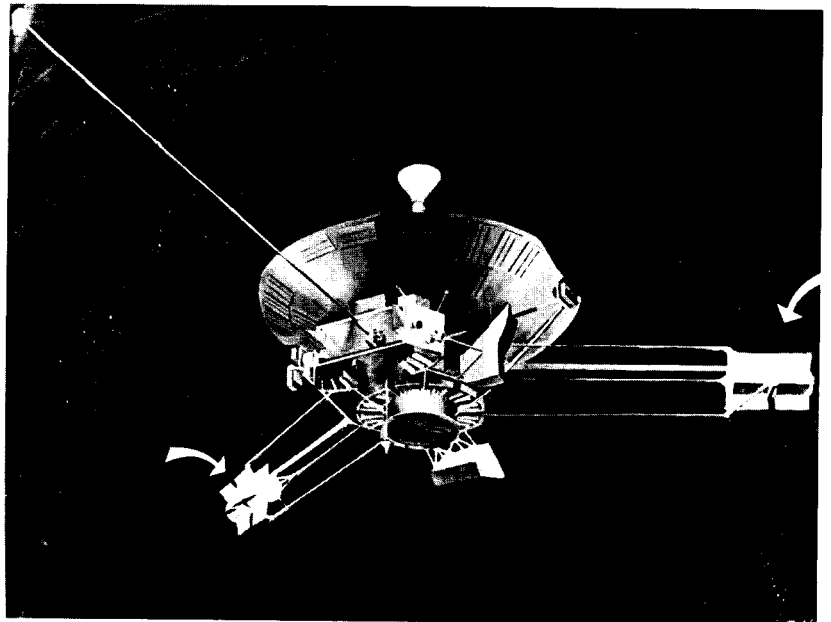
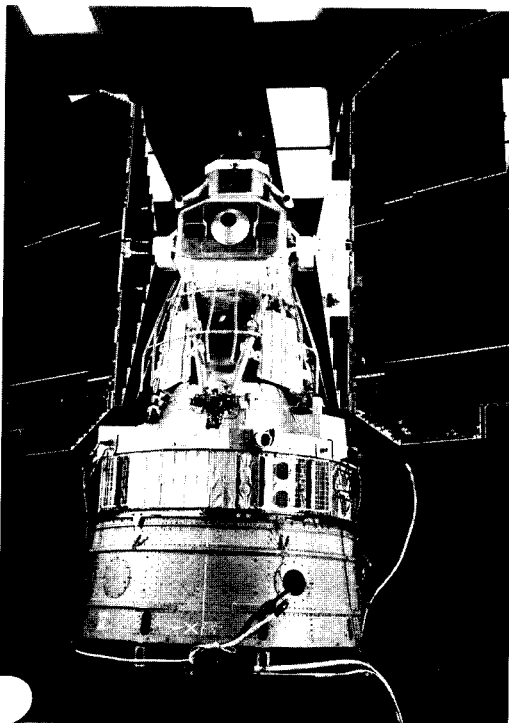


In one of the most remarkable feats closing out a decade of achievements, Edwin E. Aldrin is depicted here planting the U.S. flag on the moon.

25

1972

The interplanetary explorer Pioneer 10, now on its way out of our solar system, was man's first attempt to send automated vehicles beyond the solar system.

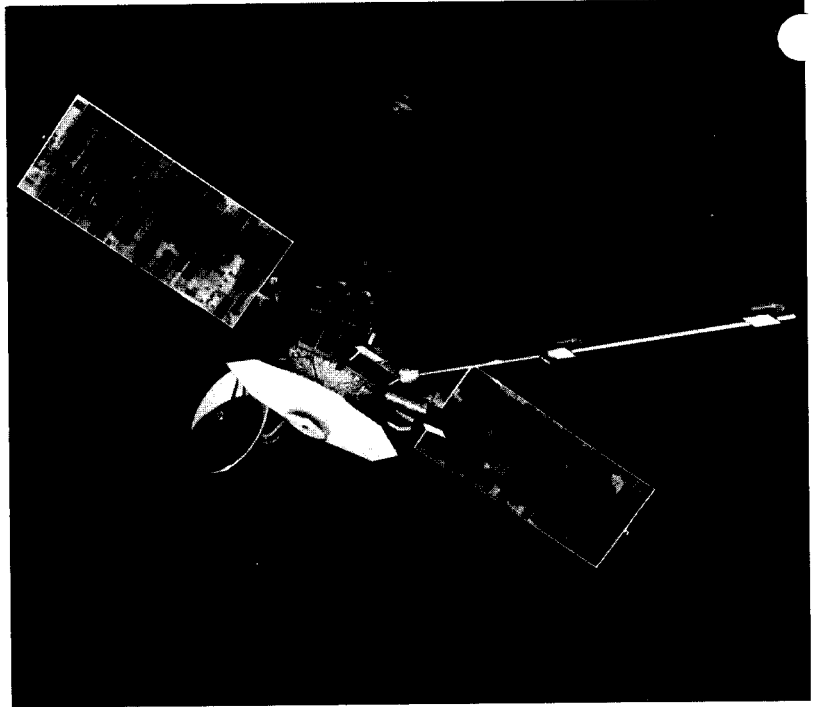


Landsat 1 was the first of four earth resources survey satellites that offered a means of monitoring changing conditions on earth's surface.

1973



Skylab was an interim space station that functioned as a large orbiting laboratory. It provided important medical data on the effects of long duration weightlessness and gave a technology base for planning a permanent space station.



25

Mariner 10 provided the first close-up views of Mercury, smallest of the solar system's nine planets.

1975



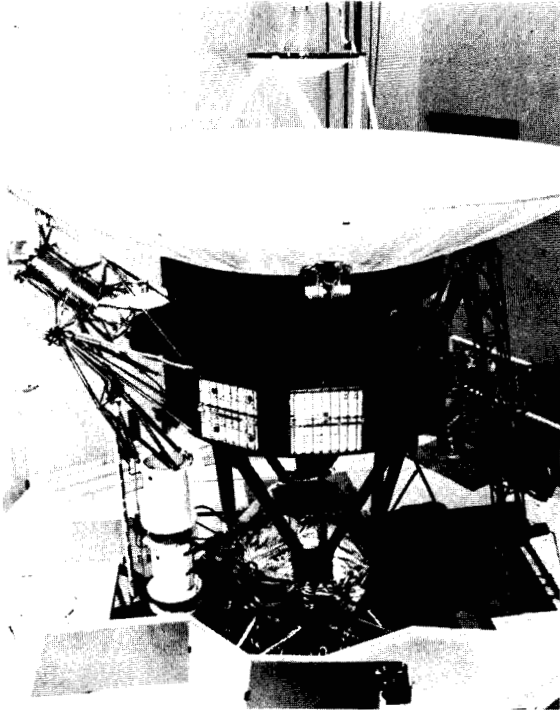
The Apollo-Soyuz project proved that international space cooperation was both feasible and successful.

1976



The Viking program involved landing two spacecraft on Mars and putting two others in orbit around the planet. A technological triumph of Apollo-like dimensions, it studied Mars intensively.

1977



The Voyager program returned tens of thousands of photos and volumes of scientific data on Jupiter and Saturn.

0-9

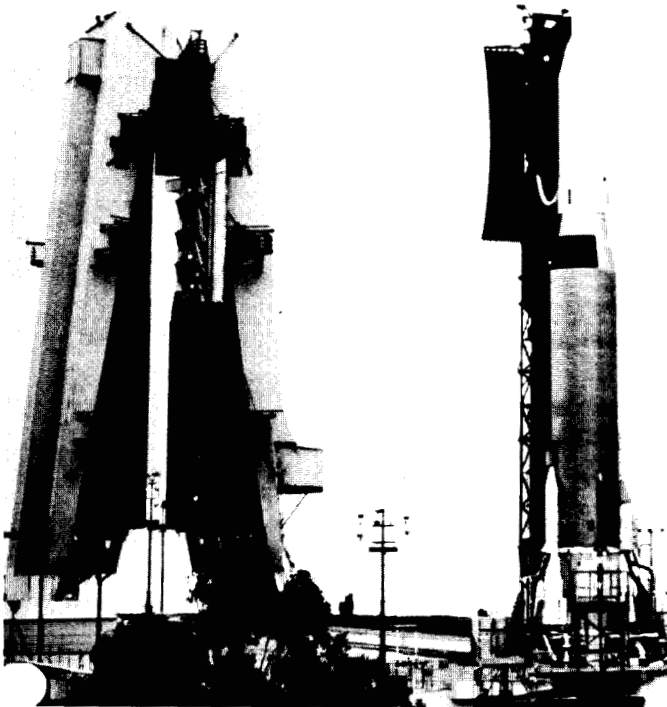
1978

The Quiet Short-Haul Research Aircraft demonstrated the technology to climb and descend at steep angles and operate from a very short runway with low-noise levels.



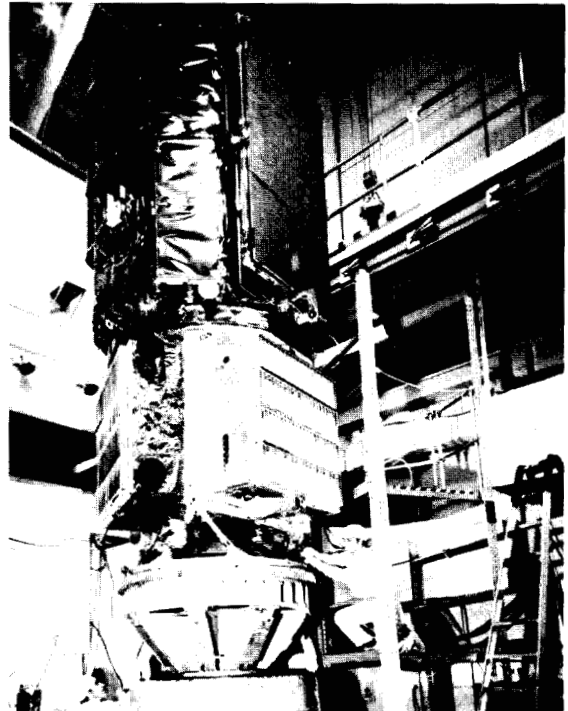
25

1979



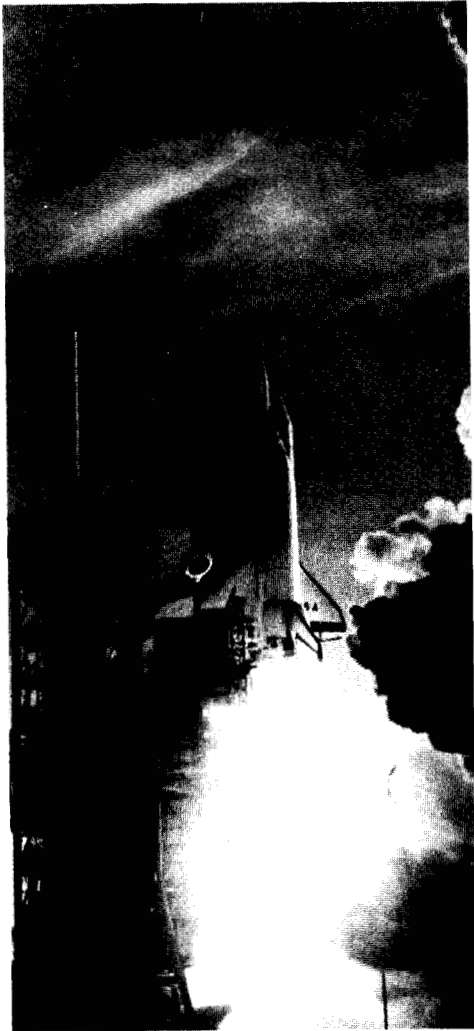
NOAA-6 pictured here ready to launch provided information on weather conditions, agricultural development and collected data for land, air, sea and solar research.

1980



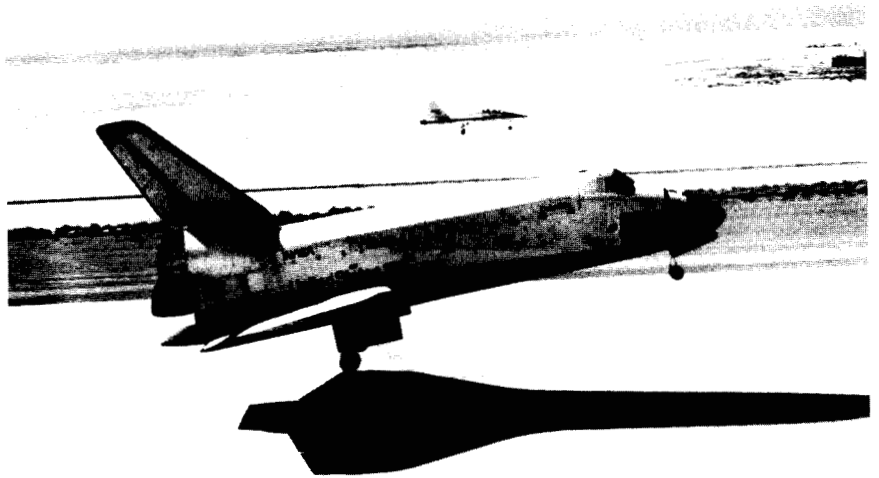
Shown here in final preparation the Solar Maximum Mission provided valuable data on the sun.

1981



A new era in space flight began with the launch of the first reusable spacecraft Columbia on STS-1.

1982



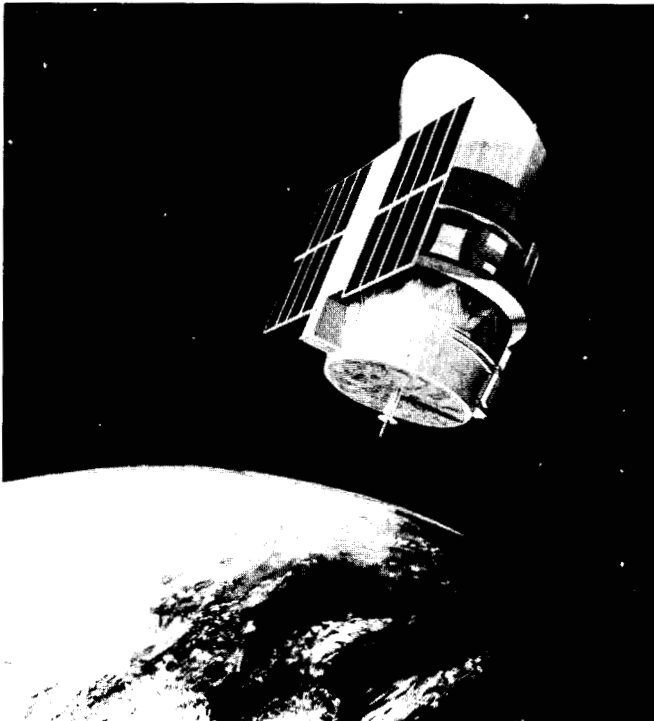
STS-4 crew members Ken Mattingly and Henry Hartsfield are welcomed home after landing by President Ronald Reagan and Mrs. Reagan.

1983



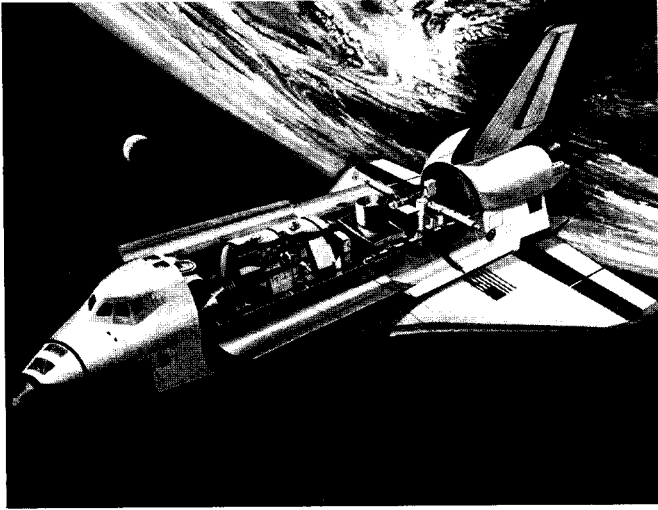
STS-7 photographed from the German satellite SPAS-01 provided live visual footage of the Space Transportation System at work.

25

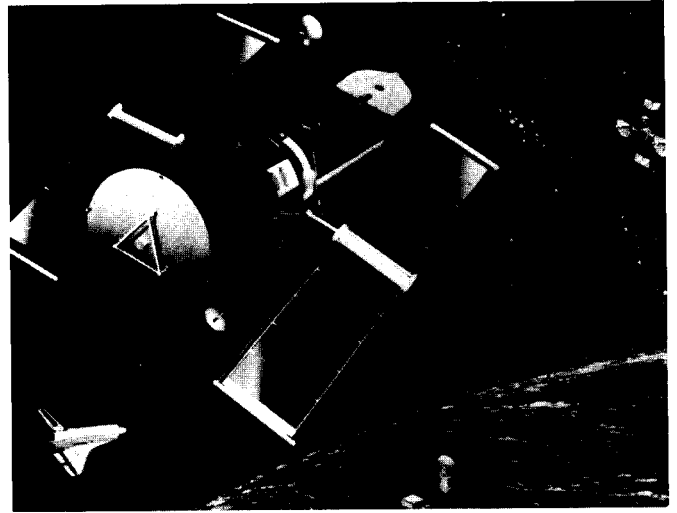


The Infrared Astronomical Satellite, capable of seeing objects by thermal emissions, discovered another comet and a possible new solar system making 1983 a year of discovery and asking the question, "Are we alone in the universe?"

The Next **25** Years

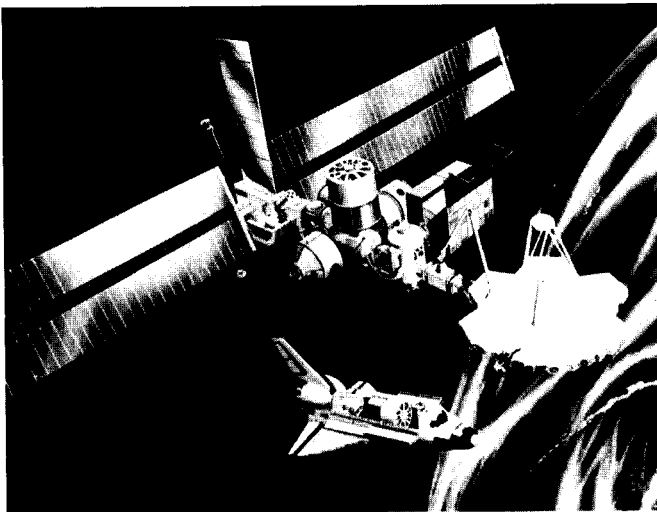


Spacelab



Space Telescope

Space Station



Lunar Manned Base

